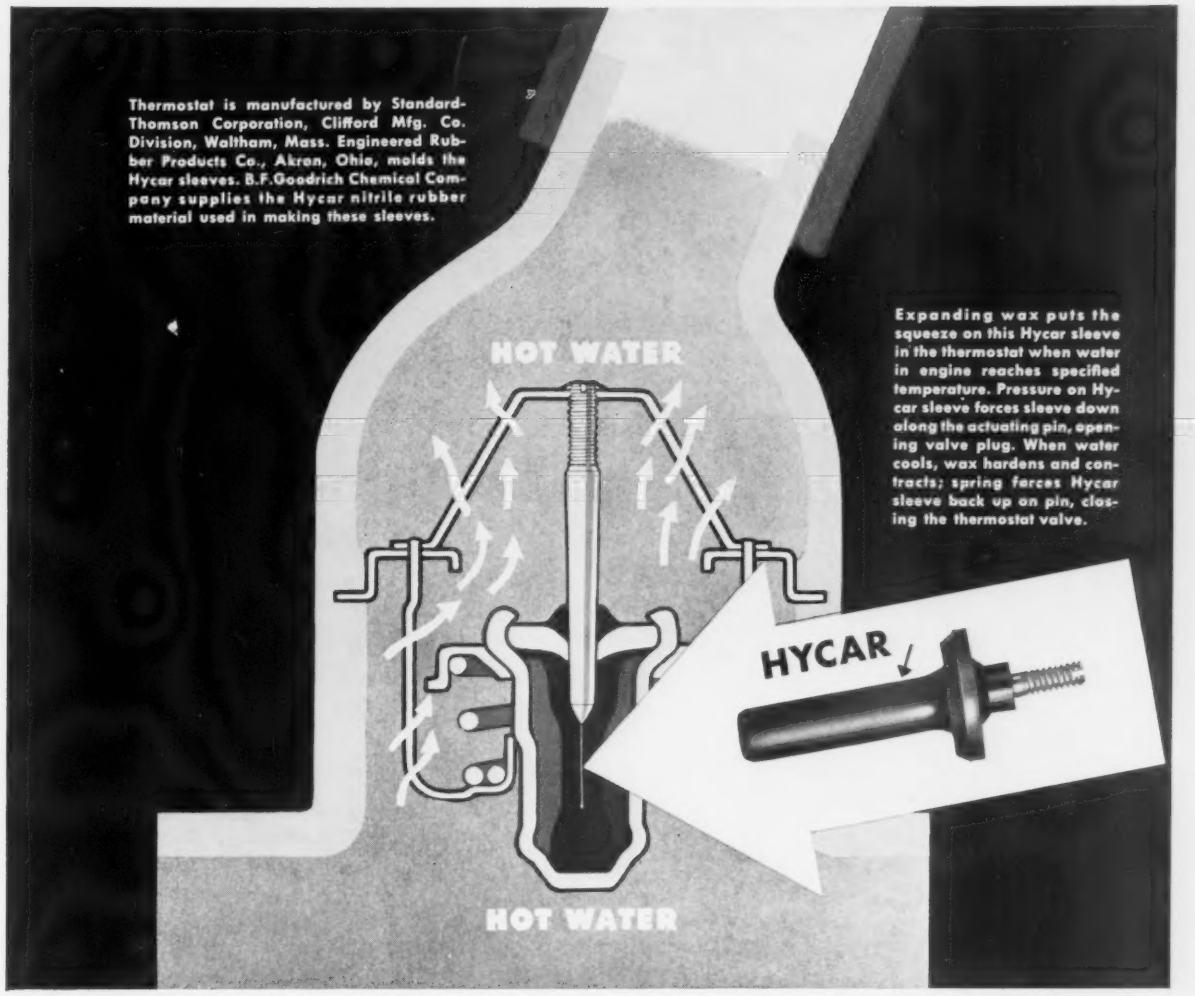
Another new development using

B.F.Goodrich Chemical *raw materials*


Thermostat is manufactured by Standard-Thomson Corporation, Clifford Mfg. Co. Division, Waltham, Mass. Engineered Rubber Products Co., Akron, Ohio, molds the Hycar sleeves. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber material used in making these sleeves.
HOT WATER
Expanding wax puts the squeeze on this Hycar sleeve in the thermostat when water in engine reaches specified temperature. Pressure on Hycar sleeve forces sleeve down along the actuating pin, opening valve plug. When water cools, wax hardens and contracts; spring forces Hycar sleeve back up on pin, closing the thermostat valve.
HYCAR
HOT WATER

Hycar controls heat of automobile engine operation

A SLEEVE of Hycar nitrile rubber solves a thermostat operating problem of high pressure cooling systems. Hycar is ideal because it is not affected by antifreeze chemicals or heat. It provides flexibility with high strength and exceptional resistance to volume change and abrasion.

Hycar nitrile rubber makes possible improved existing products and new products, too. Get information on it by writing Dept. KA-5, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Hycar
Reg. U.S. Pat. Off.
American Rubber

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

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GEON polyvinyl materials • HYCAR American rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

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PHILBLACK

Philblack* O provides good electrical conductivity!

Manufacturers of tires, industrial belting or any other rubber products in which static electricity is a problem, can overcome this trouble by using Philblack O.

Replacing regular blacks with Philblack O also provides a rubber compound with exceptionally high abrasion resistance and extremely long flex life. And at *lower costs*, too!

By adjusting the recipe and mixing time; selecting the proper Philblack at the appropriate loading, rubber compounds which range from good conductors to good insulators may be obtained. Consult your Phillips technical representative to determine the proper Philblack for *your* products.

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I **Philblack I, Intermediate Super Abrasion Furnace Black.** Superior abrasion. More tread miles at moderate cost.

E **Philblack E, Super Abrasion Furnace Black.** Toughest black yet! Extreme resistance to abrasion.

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Rubber Age

COVERING THE MANUFACTURE OF RUBBER AND RUBBERLIKE PLASTICS PRODUCTS

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In This Issue

281 **Accelerated Ozone Aging**—By W. L. Dunkel and R. R. Phelan

A study of ozone resistance of vulcanizates under various conditions together with data on the acceleration of tests.

287 **A New Container for Packaging, Handling and Storing Styrene Rubber**

On the development of the "Flotainer" package specifically designed for non-pigmented rubber.

289 **High Speed Photography in the Rubber Industry**—By G. L. Hall, J. D. Rigby and F. S. Conant

Describing the use of a high speed camera in the study of materials processing and products testing in the rubber industry.

296 **Pre-Dispersed Accelerators in Rubber Compounds**—By John Ware

Offering data on the advantages which accrue through the use of pre-dispersed sulfur in rubber compounding.

306 **Statistical Quality Control in the Rubber Industry**

A transcript of the symposium on the subject recently held by the Akron Rubber Group.

316 **Credit Rating**

A special industry report outlining the methods by which a rubber goods manufacturer can evaluate his chances of getting a bank loan.

Special Reports

Capitol Cues	265	214	News Highlights
Markets	374	352	Overseas

Regular Departments

Book Reviews	370	364	New Equipment
Canadian News	346	354	New Goods
Chemical Prices	*	348	Obituaries
Classified Ads	388	238	Patent Review
Coming Events	254	216	Shop Talk
Editorials	314	378	Statistics
Financial News	342	344	West Coast News
Names in the News	338		

*Appears every other month

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Highlights Sidelights *of the News...*

May, 1958

The 14th Annual Meeting of the Commercial Chemical Development Association held in New York City attracted over 600 persons who gathered to participate in four symposia and to hear a morning program of three highly interesting papers...The program's full schedule included a luncheon address by J. F. Blandford, counsel to the Committee on Armed Services of the House of Representatives (page 318).

Recently published reports indicate that the General Motors Corp. has undertaken an extensive experimental program to evaluate nylon tire cord...According to the reports, some 40,000 1958-model Chevrolets have been equipped with unmarked nylon cord tires in order to check consumer reaction...It is expected that the test results will have great bearing on the competitive struggles between nylon and rayon cord (page 325).

A government anti-trust suit against the B. F. Goodrich Co. and the Dayton Rubber Co. charging violation of the Sherman Anti-Trust Act in the manufacture and sale of chemically blown sponge rubber was terminated on March 31 with the signing of a consent decree...Goodrich claimed that the agreements cited by the Justice Department were "inherited" by the company with its purchase of the Sponge Rubber Products Co. in 1954 (page 326).

Polymer Corp. has announced plans for the construction of a diversified pilot plant at its Sarnia, Ont., facility for further development and evaluation of new hydrocarbon rubbers using stereospecific catalysts...Expected to cost more than $500,000, the new plant will be sufficiently flexible to handle a wide range of hydrocarbons, many of which are already in the Sarnia area (page 346).

Plans for the International Rubber Conference scheduled to be held in Washington, D. C. in November of 1959 reveal that many diversified activities will be held reflecting the activities of the sponsoring organizations...The program will include papers in the broad fields of rubber chemistry and technology, the testing of rubber and rubber products, and engineering in the rubber industry, with special reference to equipment and processes and rubber as an engineering material (page 331).

Rubber Manufacturing Industry Vacation Schedules

As a service to the rubber industry, a listing of plant vacation schedules appears in this issue. This should prove a valuable check-list for the industry and its suppliers...(page 334).

Routing Skill Speeds Huber Shipments

Many carloads of rubber clays and carbon blacks are expedited each month by our Traffic Department to all parts of the United States.

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Huber's time- and cost-cutting shipping methods are so widely recognized that many customers rely on our advice when routing *other* manufacturers' materials to their plants. Our Traffic Department will gladly help you any time with their special knowledge of routes, rates, schedules—and of hopper and boxcar availabilities.

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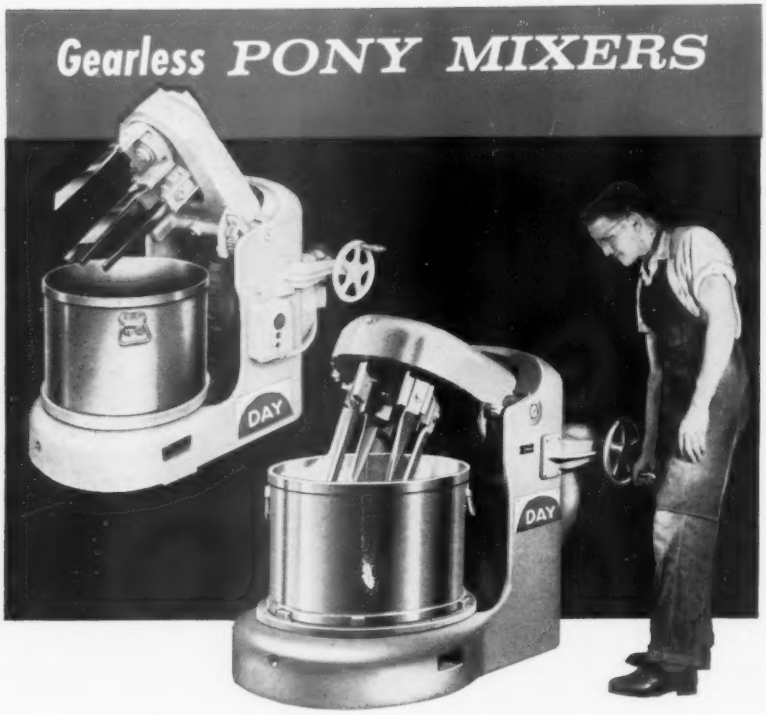

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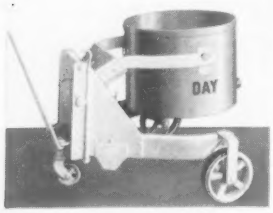

For full details, call in the Day field engineer in your area or write for Bulletin No. 500.

Mixer shown above, top, is Day Twin Motion Pony Mixer, having twin spindles with counter-rotating, overlapping blades. Shown immediately below is Day Single Motion Mixer. Day hydraulic lift trucks, left, and extra interchangeable cans, will further speed your production.

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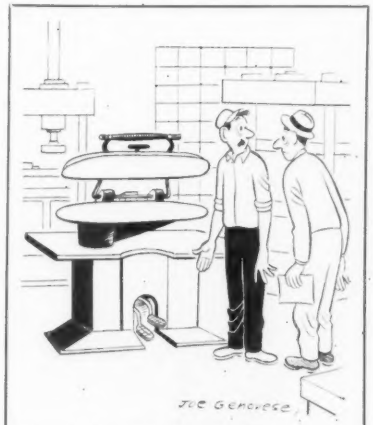
Shop Talk.....

► Many of the articles appearing in RUBBER AGE have quite a history in that the original requests for publication rights date back some years. This was the case with the article on "High Speed Photography" which appears in this issue. The subject matter originally came to our attention some two years ago, and we have been trying to get an article in print since that time. Describing the use of a high speed camera in the study of materials processing and in products testing, the article should prove to be of interest to many in the industry. Incidentally, those who attended the Rubber Division meeting in Cincinnati heard a paper on this subject.

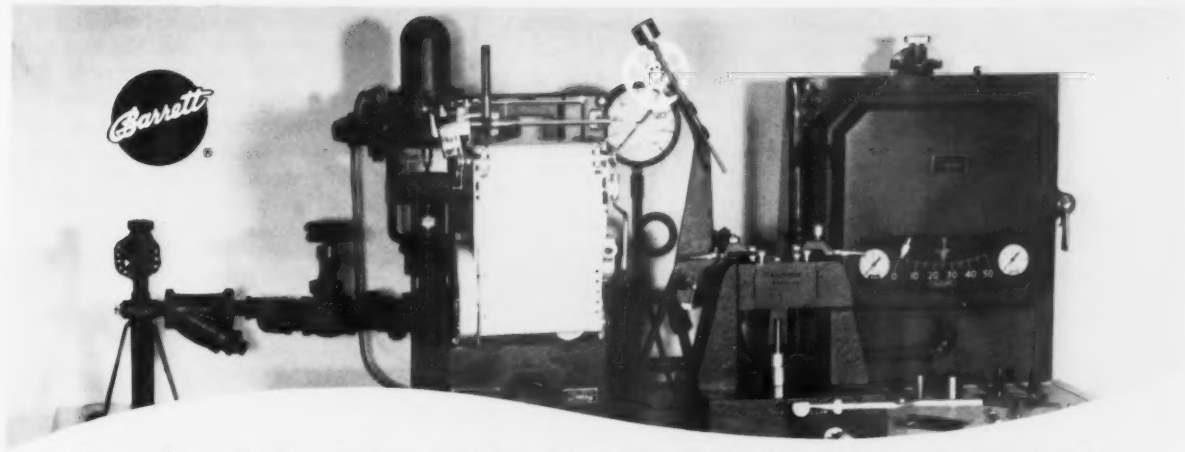
► Another in the series of articles on radiation and rubber is to be published in the June issue of this journal. This one concerns itself with the effect of gamma radiation on miscellaneous elastomers and rubberlike plastics materials. It is pleasant to be able to report that the entire series, to date, has met with enthusiastic response. Still other parts of this interesting series are scheduled for publication in early issues.

► The prolific Dr. Drogin, vice-president —research and development at United Carbon Co., Inc., has contributed another of the articles scheduled for publication in June. The good doctor has written about a practical approach to dispersion studies in which he examines the dispersion of carbon black in rubber. The "tools" required for the job are relatively inexpensive and should enable even the smaller rubber manufacturer to engage in his own research efforts.

► Ever drop in at a rubber manufacturing plant only to find it closed for vacation? In order to avoid these inconveniences we have gathered together a listing of those companies which have announced vacation schedules. It appears in this issue.



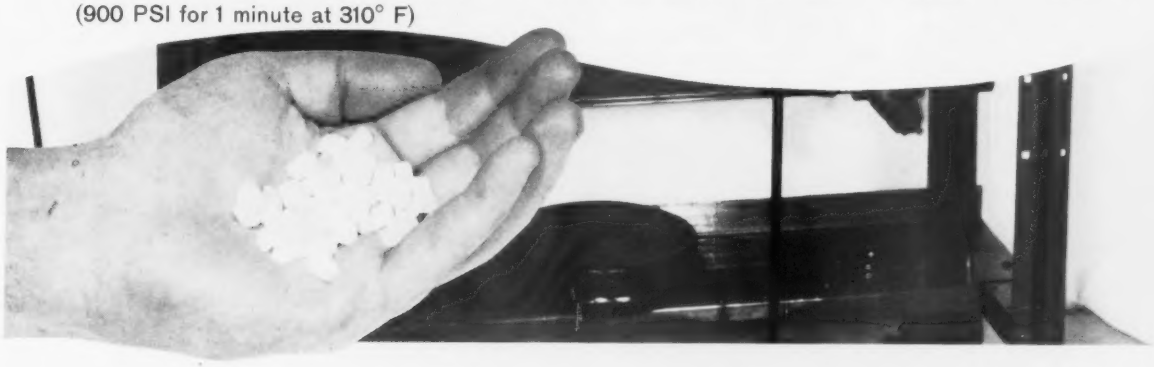
"Somebody goofed . . . this isn't the press I ordered!"



Compound No. 72B—HIGH BLACK-FILLED NITRILE RUBBER

	A	B	C	D
"A-C" Polyethylene, Parts:	0.0	2.5	5.0	10.0
Rossi-Peakes Flow Test, Inches	0.70	0.80	0.91	1.44

(900 PSI for 1 minute at 310° F)



Flow test shows what A-C† Polyethylene can do

The red figures above prove the dramatic increase in flow properties and overall processibility that "A-C" Polyethylene can achieve in your compounding of nitrile, neoprene, butyl and other hard-to-mill rubbers.

We started with a high black-filled nitrile rubber and measured its flow properties by the Rossi-Peakes test. Then we added 2½, 5 and 10 parts of "A-C" Polyethylene per 100 parts of rubber to the same stock. The Rossi-Peakes figures show the vast improvement in flow characteristics.

"A-C" Polyethylene is more than just a lubricant. It is also a tack modifier . . . an anti-shrinking and anti-blooming agent . . . a powerful processing aid. By using it, you can improve mold flow and mold release, cutting your operations costs in several ways:

1. Speed up output, reducing labor costs.

2. Reduce—often eliminate—rejects or "seconds" in heels, soles, mechanicals or intricately designed products requiring multiple cavity molds.

3. Make economical use of highly loaded rubbers which could not be commercially molded otherwise.

Success stories abound. "A-C" Polyethylene is now widely used in neoprene, GRS, butyl, nitrile and "Hypalon." By adding it to your "problem" compounds, you can make them behave themselves—with highly profitable results. Write for technical advice on applying "A-C" Polyethylene to your products.

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Allied Chemical

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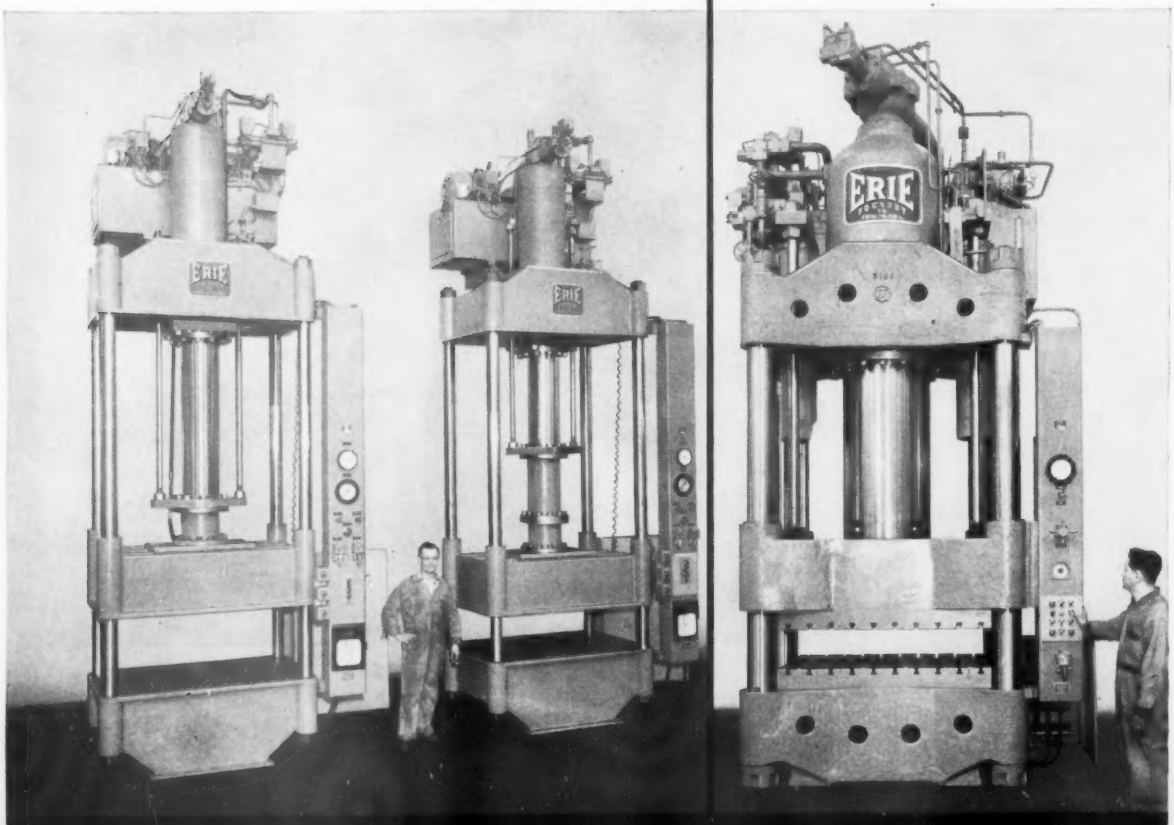
This very rugged fiberglass press is rated 750 tons with a 48" stroke. The two pull backs give 150-ton stripping capacity. Oil Gear drive with quick-acting prefill system allows molders to utilize five ram speeds in their molding cycle. Automatic short stroking of pump at required pressures for long periods of time assures both reduced h.p. consumption and oil heating. Controls are semi-automatic, and the 2 steam-heated platens are 60" x 46".



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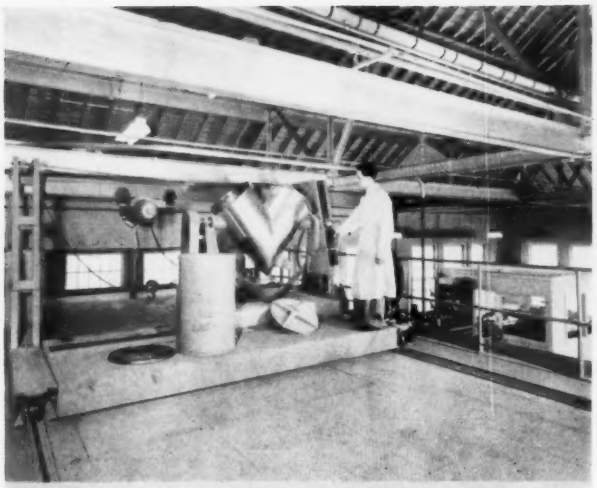
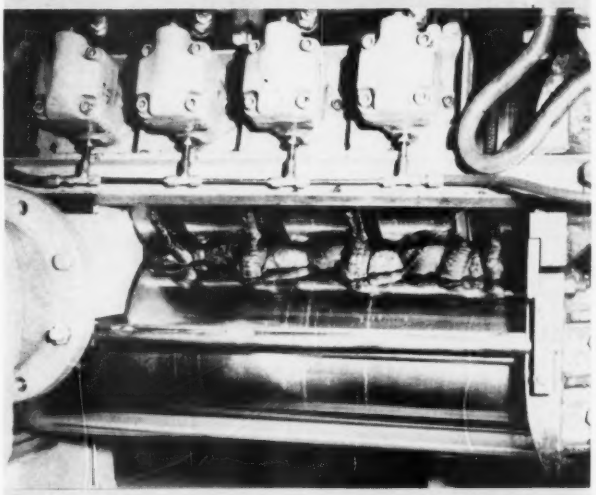
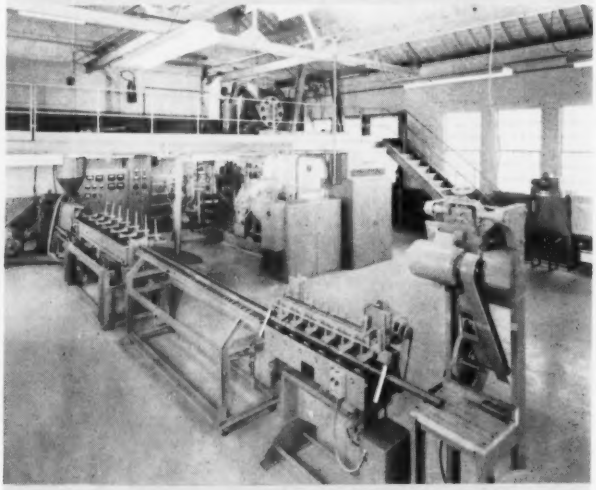


Raw material handling may include blending, automatic weighing, and controlled feeding.



The Continuous Automatic Mill dispenses pigments and plasticizes uniformly without manual attention.



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DPPD antioxidant (diphenyl-para-phenylenediamine) by nature is extremely difficult to disperse. Monsanto's preblend of 75% DPPD and 25% Santoflex DD—Santoflex 75--gives thorough dispersions faster and more easily. It provides the highest percentage of quickly dispersible DPPD on the market today--of any easy-dispersing preblend you can buy, it introduces the least amount of antioxidant "carrier" into your compound when you fulfill DPPD requirements.

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SEND COUPON FOR SAMPLE...TECHNICAL HELP. Every application, plant and process has different compound requirements. That's why Monsanto recommends no "canned" formulations or "cure-alls" - we do offer samples of Santoflex 75 and technical help in testing it out for your application. The coupon is for your convenience.

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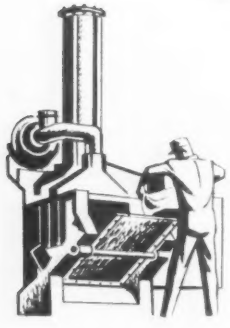

Protox-166 is outstanding for dispersion. It disperses readily in any rubber under any weather conditions . . . because it is free of aggregates and its particles are coated with zinc propionate that is readily wet by rubber.

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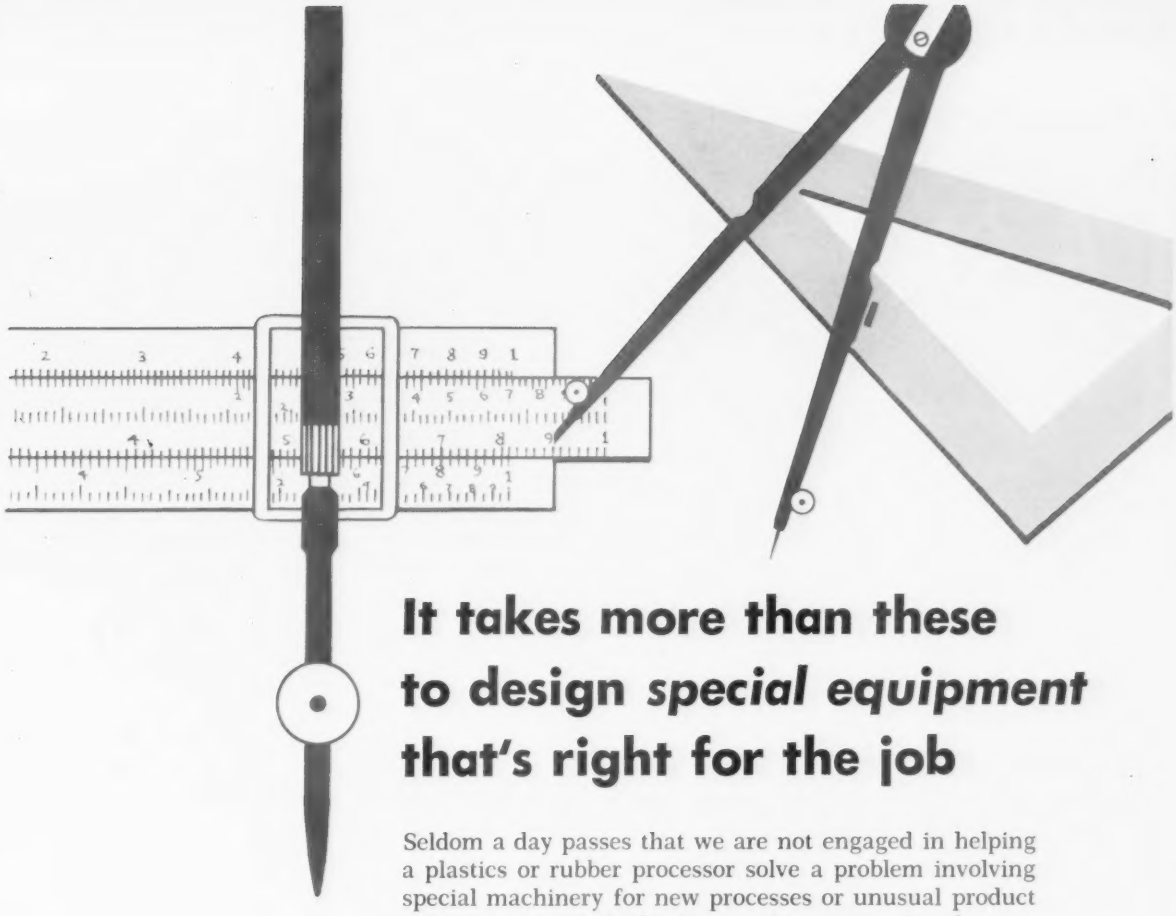

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Rubber products require safeguards against the serious deteriorating effects of ozone. Yet, you may be spending more than you need spend for this protection.

Eastozone—Eastman rubber antiozonants—guard against ozone attack more effectively at *lower cost* than do other types of commercially available antiozonants.

By using Eastozone in rubber recipes, compounders often can cut antiozonants concentration in half and get equal ozone protection. measured by static or dynamic ozone exposure tests. At current prices, this lower concentration can mean a saving of as much as 20¢ on your antiozonant dollar.

Eastozone antiozonants are easily incorporated into the rubber formula during processing. They slowly exude to the surface of the finished rubber product, affording long-lasting protection against checking and cracking caused by atmospheric ozone.

For economical and effective ozone protection, specify Eastman antiozonants for your rubber recipes. Ask your Eastman representative today for samples of Eastozone 30 and Eastozone 31 for evaluation by your laboratory staff, or write to Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Company, Kingsport, Tennessee.

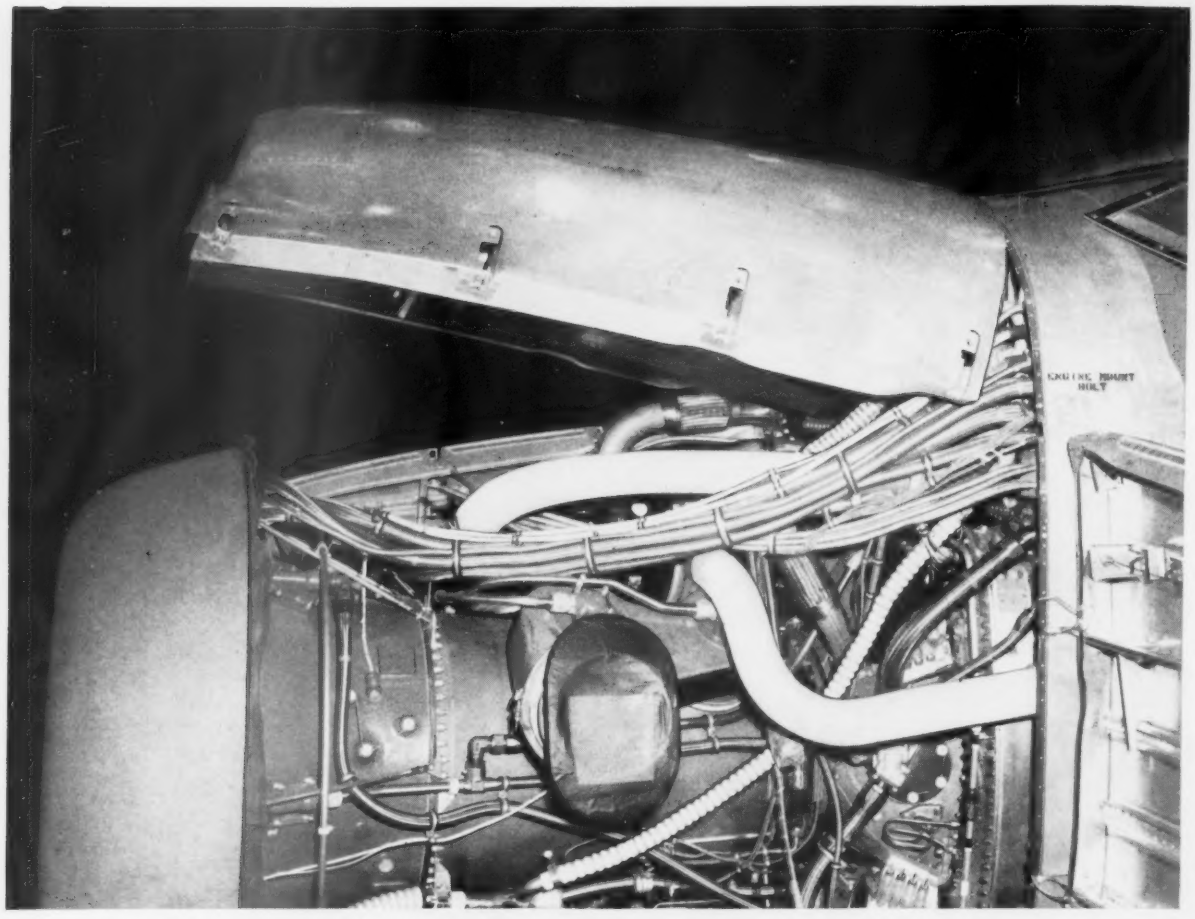
Chemical Description of Eastman Antiozonants

Eastozone 30	N,N′-di-2-octyl p-phenylenediamine
Eastozone 31	N,N′-di-3-(5-methylheptyl) p-phenylenediamine

(formerly Tenamene 30 and 31)

Eastozone Eastman Rubber Antiozonants

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tennessee; New York City; Framingham, Massachusetts; Cincinnati; Cleveland; Chicago; St. Louis; Houston. **West Coast: Wilson Meyer Co.,** San Francisco; Los Angeles; Portland; Salt Lake City; Seattle.



SILASTIC 432 Base

Makes Hose Serviceable From –100 to +500F

TYPICAL PROPERTIES OF
HOSE, DUCTS AND TUBING COMPOUND
MADE WITH SILASTIC 432 BASE

	Cured 24 hrs at 480 F	Aged 24 hrs at 600 F
Temperature range, degrees F	—100 to	+500
Specific Gravity		1.27
Hardness, durometer	55	60
Tensile Strength, psi	850	770
Elongation, %	250	200
Compression Set, percent, 22 hrs at 300 F	20	18

Properties obtained on ⅛" ASTM slabs or buttons, molded 5 minutes at 240 F.

The compounding of stocks with superior physical properties for hose, ducts and tubing is easier with Silastic* 432 Base. This partially-compounded silicone rubber gum requires no bin aging after compounding, is easy to calender onto glass, dacron or nylon and can be dispersed in solvents for spread, dip or flow-type coatings. All compounds made from Silastic 432 Base retain remarkable resistance to extreme temperatures and abrasion. They have high tensile strength, good elongation and low compression set.

Do you want the recipe? *Complete instructions for compounding Silastic 432 Base for hose, duct and tubing compound is yours for the asking at the nearest Dow Corning branch office.*

FREE SAMPLE... *Try Silastic 432 Base in your own plant. Write today. Address Dept. 925.*

A team of compounding and fabricating experts is available for visits to your plant. If you would like this team to work with your group, contact your Dow Corning representative.

first in silicones

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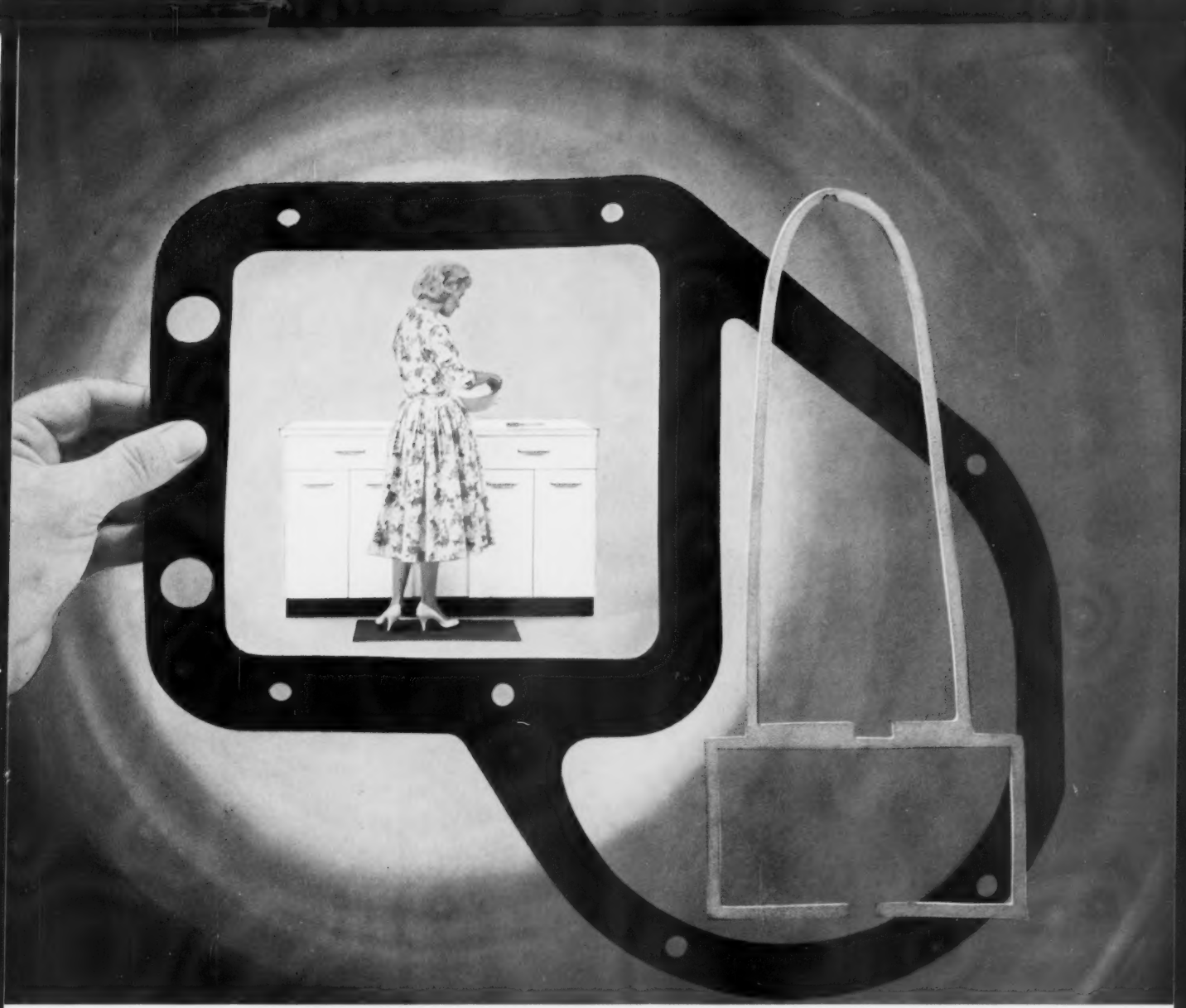


Photo courtesy Bearfoot Airway Corporation, Wadsworth, Ohio

Secret of a full-blown success

The inside story on the success of the rubber cushion rug and gaskets shown above lies in their internal structure. Through a carefully controlled chemical reaction, solid PLIOFLEX rubber is transformed into thousands of tiny, individual, uniform, nitrogen-filled bubbles. The end results are permanent resiliency and unusual durability that add up to outstanding cushioning and sealing.

It's not easy to produce a top-quality, chemically blown, closed cell sponge. Uniform plasticity and consistently low moisture content of the base rubber are essential to obtaining just the right cell structure. And these properties, along with its light color that stays light, are the main reasons why PLIOFLEX is used.

If you're seeking success for any product that is, or could be, made of rubber, make sure you have the full story on PLIOFLEX. It's yours, along with complete technical assistance, simply by writing Goodyear, Chemical Division, Dept. Q-9419, Akron 16, Ohio.

GOODYEAR

60

CHEMICAL DIVISION

CHEMIGUM • PLIOFLEX • PLIOLITE • PLIOVIC • WING-CHEMICALS

Chemigum, Plioflex, Pliolite, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

Photo courtesy Lehigh Safety Shoe Company, Emmaus, Pa.

A sole improvement with a four-fold return

Four times longer life! That was the return on a single improvement made in the safety shoes pictured above—as proved in actual wear tests at a big metal-working plant.

What made the difference was a new kind of sole. It's made of a blend of CHEMIGUM, the truly oil-resistant rubber, and PLIOFLEX, the light-colored styrene rubber. The end result is outstanding resistance to the cutting oils, metal turnings and sharp grating that so quickly took the toll of the other test shoes.

Other advantages of the new sole include an attractive, light color, a very comfortable resistance to flexing and abrasion. Equally important are the facts that the CHEMIGUM blend is easy to process and can be adjusted to meet any need for oil resistance at minimum cost.

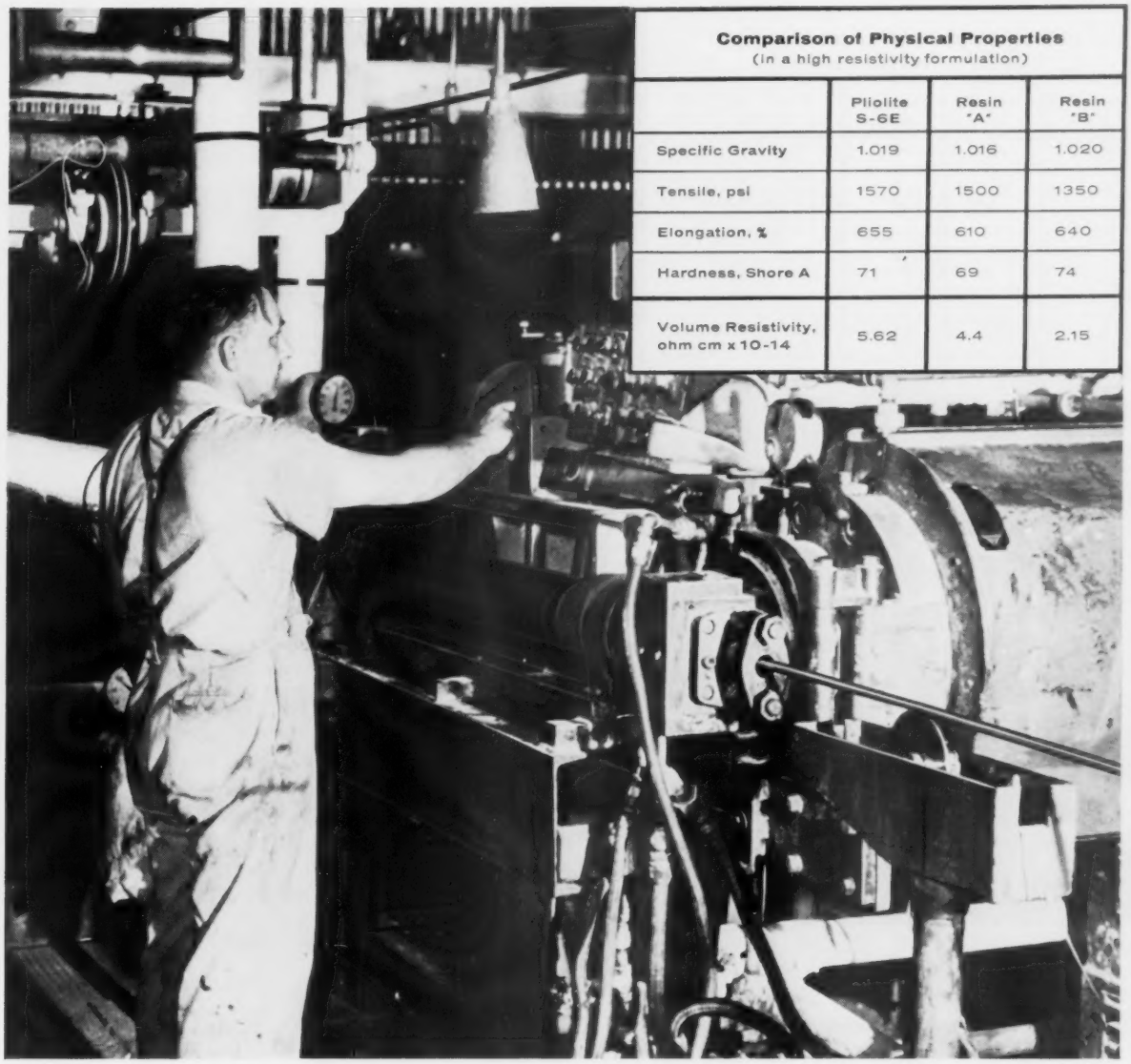
If you're looking for an improvement in any rubber product, why not look into blends of CHEMIGUM and PLIOFLEX. Full details and technical service are yours by writing to:

Goodyear, Chemical Division, Dept. Q-9419,
Akron 16, Ohio

GOODYEAR

CHEMICAL DIVISION

Chemigum, Plioflex—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio



Comparison of Physical Properties
(in a high resistivity formulation)

	Pliolite S-6E	Resin "A"	Resin "B"
Specific Gravity	1.019	1.016	1.020
Tensile, psi	1570	1500	1350
Elongation, %	655	610	640
Hardness, Shore A	71	69	74
Volume Resistivity, ohm cm x 10-14	5.62	4.4	2.15

Photo courtesy, The Okonite Company, Passaic, New Jersey

New way to meet tight wire "specs"—with ease!

It's here! PLIOLITE S-6E—the new electrical grade, rubber reinforcing resin that will enable you to meet tight wire covering specifications with ease. In trial plant runs, for instance, PLIOLITE S-6E has been particularly successful in meeting the requirements for covering on HW and RW Wire.

PLIOLITE S-6E is a new high styrene/butadiene copolymer which not only exhibits superior electrical properties (see data above), but also processes and reinforces on a par with any resin on today's market. And best of all, it's offered at the same price as ordinary reinforcing resins.

We think you'll be pleasantly surprised at just how well PLIOLITE S-6E performs. But the best way to find out is to put it through its paces yourself. Samples and full details, including the latest *Tech Book Bulletins*, are yours by writing Goodyear, Chemical Division, Dept. Q-9419 Akron 16, Ohio.

GOODYEAR

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Pliolite—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

AZODOX

TRADE MARK

New, Higher Density Zinc Oxide

INCREASES MIXING CAPACITY ...SPEEDS PRODUCTION

HERE ARE OTHER REASONS WHY AZODOX IS BEST FOR YOU

Twice the Density, Half the Bulk. Cuts storage space in half. Despite high density, perfect texture of material is unchanged. AZODOX package is shaped, permitting close-packed, well-formed unitized shipments.

Flows More Freely, Less Dusting than conventional zinc oxides.

Physical Properties Unchanged Except for Density. Surface area, size and shape, color and all other physical properties of AZO-ZZZ, American Process, zinc oxides are unaltered. *Apparent density only is changed.* All chemical properties are unchanged.

AZODOX Cuts Your Costs. Faster handling, easier storing, quicker mixing save you money.

AZODOX now ready for you in unlimited quantities. Priced the same as conventional zinc oxides. Available in surface treated form if desired.

Tests prove AZODOX, new form of zinc oxide (de-aerated), to be superior in all mixing operations. AZODOX incorporates readily, disperses completely in both hard and soft stocks, at high or low concentrations, on the mill or in the Banbury. Hard crust, common to pellets, is never present to cause dispersion problems. *Unlike pellets AZODOX does not consist of agglomerates.*

AZODOX is available in all grades of American process lead-free zinc oxide.

American Zinc sales company

Distributors for
AMERICAN ZINC, LEAD & SMELTING COMPANY
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Everyone's talking about the new "cold," low Mooney polymer

ASRC 3110!

Gives improved processing... better quality!

Rubber parts courtesy of Brown Rubber Co., Inc.

ASRC is now in production with a new, non-staining "cold," low Mooney rubber—ASRC 3110—which offers improved processing of molded and extruded sponge rubber parts. Users can expect easier mixing . . . smoother extrusion . . . faster extrusion rates . . . smoother calendering . . . less shrinkage.

ASRC 3110 also gives improved quality, such as better aging . . . higher tensile strength . . . and better hot tear resistance.

Literature and test samples available upon request.

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Goodrich-Gulf Chemicals, Inc.

Ameripol RUBBER

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Ameripol 1006 crumb—23% bound styrene copolymer with a non-staining antioxidant.
Ameripol 1012 crumb—similar to Ameripol 1006 with higher solution viscosity and greater green strength.
Ameripol 1013 crumb—43% bound styrene copolymer with increased thermoplasticity, strength and water resistance.
Ameripol 1009 crumb—23% bound styrene copolymer with cross-lining agent to give a gel-like consistency.

NEW FORM FOR AMERIPOL

Rubber crumbles...cost tumbles

Processing cost savings are considerable with Ameripol hot polymers in "crumb" form. You no longer need expensive milling and cutting or pelletizing equipment in solution processes. Ameripol "crumb" form rubber can be dissolved in a churn or a simple agitated vessel.

This innovation in SBR rubber was developed by Goodrich-Gulf research for manufacturers of rubber adhesives, mastics, cements or other products where rubber raw material must be put in solution before processing. It cuts costs in molding and extrusion, too. Manual cutting of conventional bales of rubber to exact weight can be eliminated.

Ameripol hot polymers in crumb form have been fully evaluated in use and are available in production quantities. More than ever, Ameripol is the preferred man-made rubber. Contact us for your requirements.

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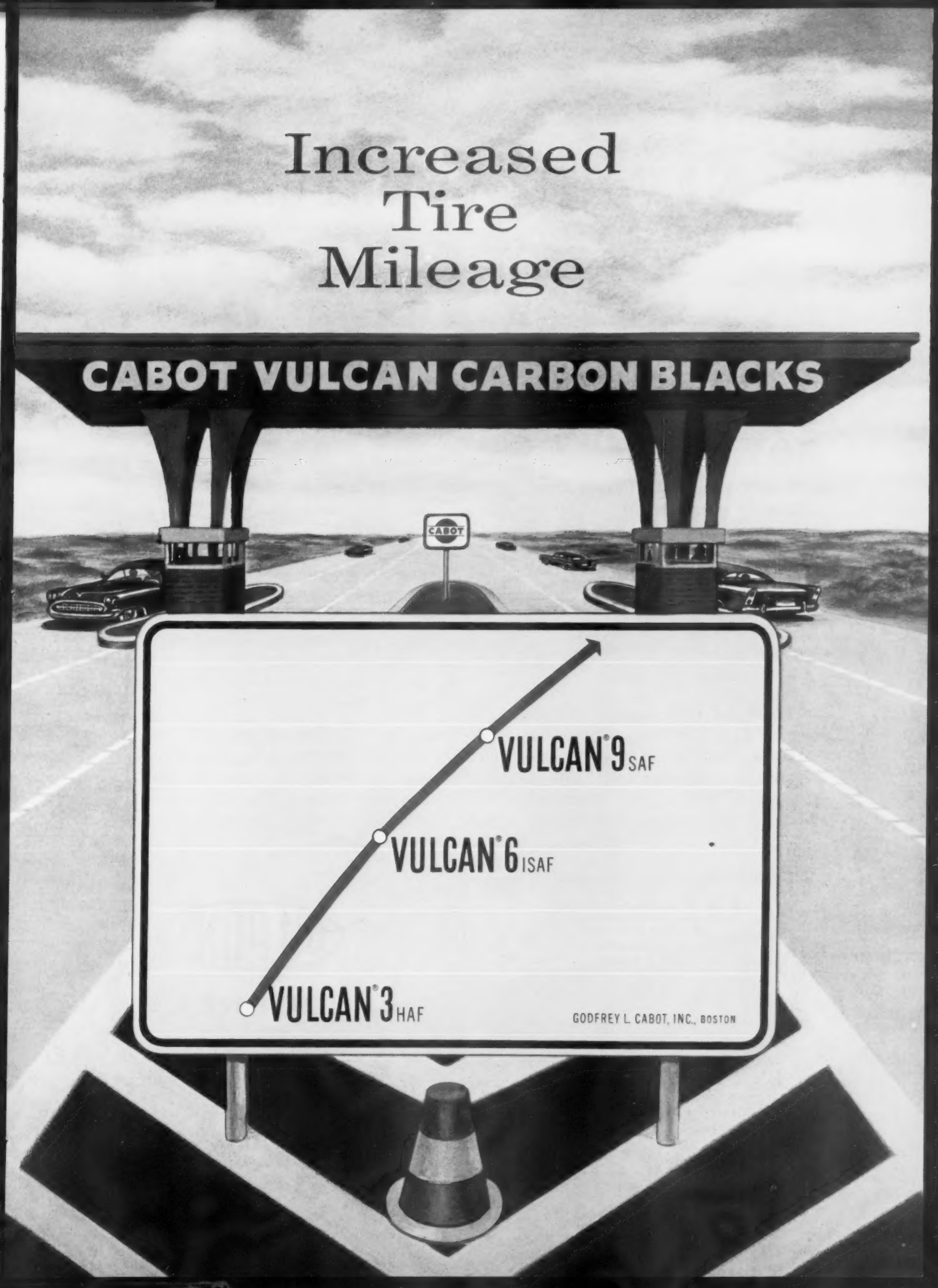
THE NAME TO REMEMBER FOR QUALITY BACKED BY YEARS OF RESEARCH AND EXPERIENCE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Tire
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CABOT VULCAN CARBON BLACKS
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VULCAN® 9 SAF
VULCAN® 6 ISAF
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GODFREY L. CABOT, INC., BOSTON

NEW...from Du Pont NEOPRENE TYPE-AD

A new color- and viscosity-stable neoprene for quick-setting adhesive cements

Neoprene Type AD is an improved neoprene for use in adhesive cements, outstanding in its retention of solution viscosity and original color.

VISCOSITY—Neoprene Type AD solutions show high resistance to "drop-off," or thinning out, during storage. Aged at room temperature, the viscosity of the Type AD polymer shows no significant change. At elevated temperatures, the viscosity increases only slightly.

COLOR—In both chip and solution form, Neoprene Type AD is unusually resistant to discoloration. Water-white toluene solutions keep their clear, light appearance after aging at elevated temperatures. Type AD chips do not darken when stored for long periods. Tests indicate a high degree of color stability when high "gum" cements are stored in metal drums.

ADHESIVE PROPERTIES—Neoprene Type AD gives the same quick, strong bonds that are typical of the better known adhesive grades of neoprene, and possesses essentially the same curing characteristics. Type AD crystallizes very rapidly at room temperature; it gives outstanding bond strength immediately after the adhesion bond is solvent-free.

Du Pont Neoprene Type AD combines two significant improvements in stability with outstanding adhesive properties. For more information about Neoprene Type AD, contact the district office nearest you or write for Report 58-1.

E. I. du Pont de Nemours & Co. (Inc.)
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In natural, GR-S, Neoprene and Butyl rubbers MICROFLAKE offers maximum protection against the action of atmospheric deterioration. Blooming to the surface, it forms a continuous protective film which does not change under varying climatic conditions, due to the migration rate being fairly constant at high or low temperatures.

Low melting point of MICROFLAKE, plus its very small thin flake size assures rapid and complete dispersion during mixing. It has no effect on the rate of cure.

MICROFLAKE is recommended for passenger car, truck, and tractor tires, channel rubbers, weatherstrips, boots, gas tank filler, neck grommets, insulated wire and cable, hose, belting, footwear, clothing, druggist sundries, and sponge rubber products such as door and trunk sealers.

A test sample incorporated in any of your compounds will convince you of MICROFLAKE's outstanding protective qualities. Write us today. . . . No Obligation, of course.

Also Mfgrs. of **RUBBEROL** SYNTHOL and GLYCERIZED LUBRICANT

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RUBBER MATERIALS DIVISION

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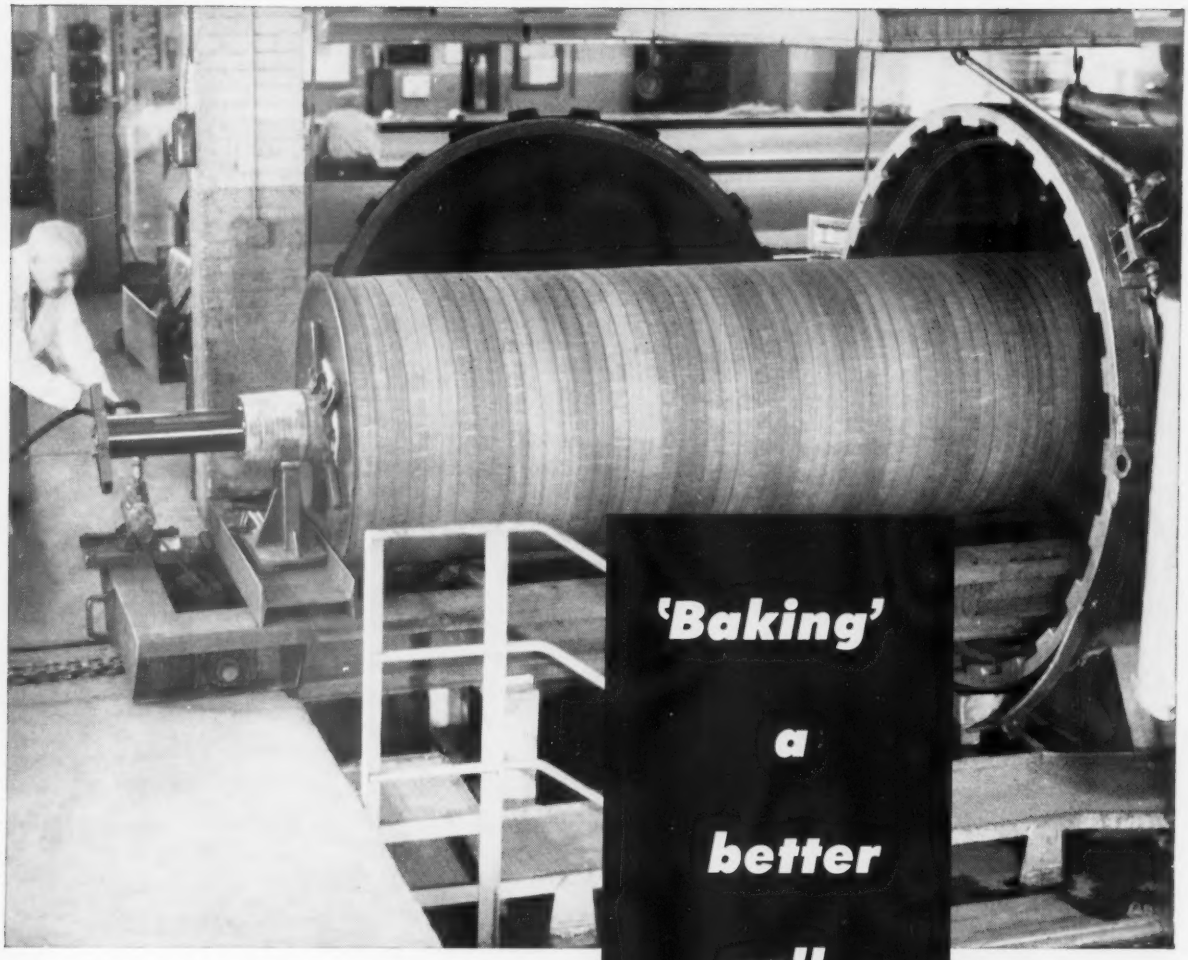

'Baking' a better roll— with fabric!

Rubber rolls are basic production tools in such industries as paper making and textile finishing. And though seemingly uncomplicated, they are actually quite complex, in the making, for the finished roll must offer just the right combination of hardness and durability, good gripping surface and low-cost maintenance with minimum down-time. Fabric plays an important part in establishing these qualities—as a cure wrap, wound tightly around the rubber surface, it holds the uncured rubber firmly, maintains the shape while the roll goes through high-temperature vulcanizing.

The fabric provided here is a Wellington Sears cotton duck, selected for its ability to withstand high heat, moisture and tension. It is just one use of this fabric, and one of the long list of fabrics supplied to industries by Wellington Sears for over a hundred years, to help develop new products and processes, and improve existing ones. Certainly, with this kind of background, Wellington Sears can help you solve your fabric problems. Call us, and write Dept. G-5 for informative booklet, "Modern Textiles for Industry."

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FIRST In Fabrics For Industry

For Mechanical Goods, Coated Materials
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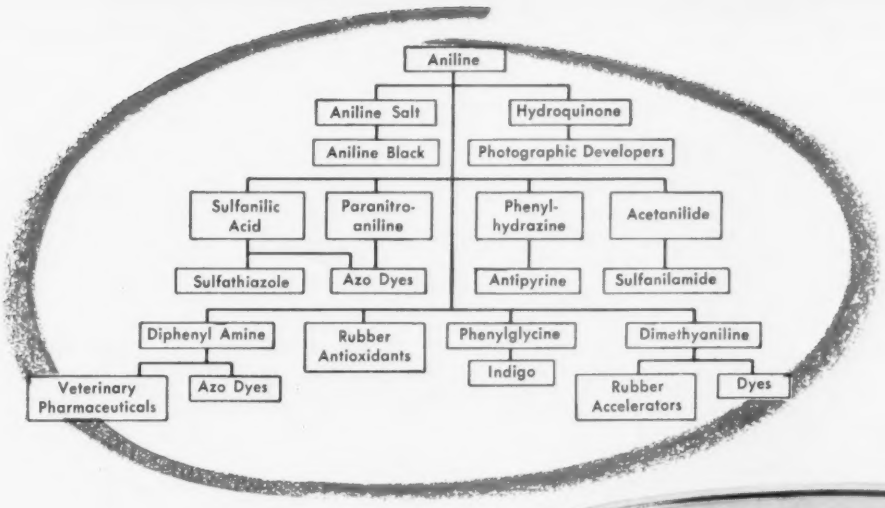
WEST POINT TEXTILES
WEST POINT MANUFACTURING CO

• Rubber rolls being removed from vulcanizing oven at Stowe-Woodward, Inc., Newton Upper Falls, Mass. Other roll covering plants located at Neenah, Wisc. and Griffin, Ga.

• Wellington Sears duck being wrapped around Release roll before vulcanizing.



Wherever you use ANILINE... Better check these reasons to specify NATIONAL®

We should know how to make top-quality aniline — we've been the leading producer since 1884! Right now we're making and delivering it six ways better than ever before:

Pure — Our shipping "spec" calls for 99.9+%. That's higher than the ACS spec for CP aniline.

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Clear — Color as shipped is 1.0 maximum by Barrett Standard. That means no discoloration of your intermediates or end products.

"Fresh" — We make, load and ship continuously to minimize the color degradation inherent in aniline.

Uniform — Twin catalytic-hydrogenation units operating under National's unique process are controlled by automatic instrumentation. That means uniform, round the clock tonnage-output!

Fast — Tank car, tank wagon shipments from Moundsville, W. Va. on 24-hour notice. Minimizes your inventory.

You pay no premium for National six-ways-good Aniline. Why not get our quotation?

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AUTOMATIC
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Ideal for processing
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WHENEVER side register control is important, the Stanford WEB GUIDE can save its cost *many times over* by eliminating spoilage . . . maintaining accuracy . . . permitting full-speed operation. Operated by a super-sensitive diaphragm motor, it *instantly* corrects any change in web path by actually shifting roll at in-feed—holds side register *within plus or minus .010 inch!*

- Available with or without constant tension
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- Handles any width — up to 10,000-lb. rolls
- Permits speeds up to 2,000 ft. per minute
- Unconditionally guaranteed

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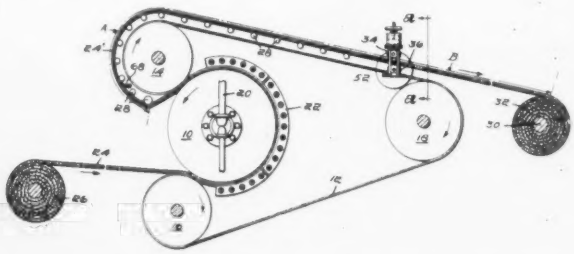
PATENT REVIEW

by Melvin Nord

Stress-Relieving Treatment of Belting

U.S. PATENT 2,812,542, issued November 12, 1957 to William C. Bleher and assigned to American Biltrite Co., describes a stress-relieving treatment of rubberized belting directly following its passage through the vulcanizing field.



The vulcanizing machine, shown in the accompanying diagram, consists of a vulcanizing drum (10) and an endless steel band (12). The steel band passes about the drum, top and bottom guide rolls (14 and 16), and a rear roll (18). The drum is heated by passing steam into it through a pipe (20) and into steam heated jackets (22).

The drum (10) is rotated in the direction of the arrow and the belting (24) to be vulcanized is fed from a supply roll (26) to the drum beneath the band (12), as illustrated. In its passage from the roll (26) to the drum, the belting is placed under tension and stretched a predetermined amount, so that the belting in the vulcanizing field is subjected to longitudinal tension, pressure, and heat, and is thus vulcanized during its passage through the vulcanizing field.

The vulcanized belting is stripped simultaneously from the drum and band as it leaves the vulcanizing field, and is then conducted through a cooling path with both faces exposed to the atmosphere. During this passage the belting is held in slack condition to relieve it of internal stresses. When the belt reaches the belt-gripping rolls (34 and 36), it is gripped by them with sufficient force to produce the desired windup tension at the reel. According to the inventor, a product having a controlled and accurate stress-strain modulus is thus obtained.

Continuous Production of Latex Foam

U. S. PATENT 2,809,172, issued October 8, 1957, to Alexis W. Keen, assigned to United States Rubber Co., tells how to make foam rubber from natural or synthetic rubber latex, so that the foam or sponge rubber will be highly uniform as to bubble size and density. This is accomplished by preparing a soap froth that is

Do your tires wear out

. . . or give out?

UOP 88® and 288®

protect your tires against ozone damage

Ozone deterioration . . . identifiable by cracking and checking . . . weakens tire compounds and can, in extremely high-ozone level atmospheres, destroy a tire's usefulness before it has even hit the road.

Many protective measures will do under static conditions . . . shelf storage, for instance . . . but are inadequate or altogether useless under the conditions of stress, flex, elongation and temperature extremes that a tire is subjected to in use.

UOP 88 and 288 afford a built-in chemical barrier to ozone that protects the tire against ozone attack for as long as the tire will last. These antiozonants migrate to the tire surface to present a constantly replenished impregnable barrier against ozone. Incorporated into your compounding recipe in loadings suited to your exposure conditions, UOP 88 and 288 give you the kind of dependable product protection you want to insure complete dealer and customer satisfaction.

UOP technical service representatives stand ready to help you determine the correct antiozonant formulation for your product. Without obligation you are invited to consult them by mail, phone or in person.

UOP 88® and 288®

RUBBER ANTIOZONANTS

UOP®

UNIVERSAL OIL PRODUCTS COMPANY

30 Algonquin Road

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WEATHERING and LIGHT AGING of RUBBER PRODUCTS

can be determined with SPEED and ACCURACY in

ATLAS-OMETERS

WEATHER-OMETER ®

A constant volume of air at a controlled temperature in the heavily insulated cabinet, maintains uniform predetermined specimen temperatures regardless of variations in room conditions.

Automatic control of humidities up to dew point is available as optional equipment.

All automatic controls are located on the front panel of the Weather-Ometer directly above the door of the test chamber.

Both horizontal and vertical testing is available. Shallow containers are used for semi-liquid materials and vertical panels for solid materials.

Source of radiation is two Atlas enclosed violet carbon arcs.

Complete technical information on the DMC Model and other Weather-Ometers is contained in the new Weather-Ometer catalog. Copy on request.

FADE-OMETER ®

The Atlas Fade-Ometer has world-wide acceptance as the standard machine for testing the action of sunlight on materials.

A wide range of industrial products are tested daily in Atlas Fade-Ometers to determine the deterioration of materials due to the action of sunlight.

From 21 to 126 samples, depending on size, can be simultaneously exposed to the light of the Atlas Enclosed Carbon Arc. Temperature is controlled automatically and humidity is furnished by evaporation from a constant water reservoir. Operation of the Fade-Ometer is completely automatic, permitting the machine to be left in continuous 24-hour operation.

The Carbon Arc Lamp in the Fade-Ometer produces radiation at the sample similar to sunlight, both as to intensity and spectral distribution.

If your product is subject to deterioration by sunlight our engineers, with over a quarter of a century of experience in predetermining the fading of materials, can help you. *Catalog with technical information on request.*

ATLAS ELECTRIC DEVICES COMPANY

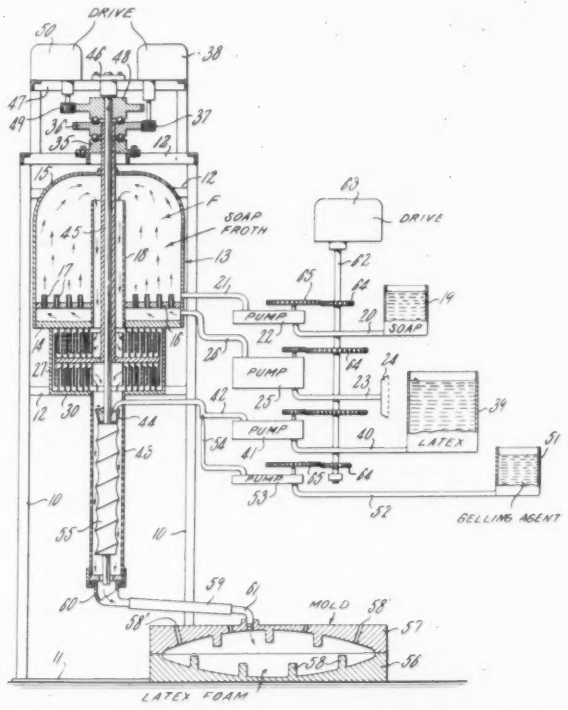
4114 N. Ravenswood Ave., Chicago 13, Ill.

Manufacturers of accelerated testing equipment for over a quarter of a century.

PATENT REVIEW

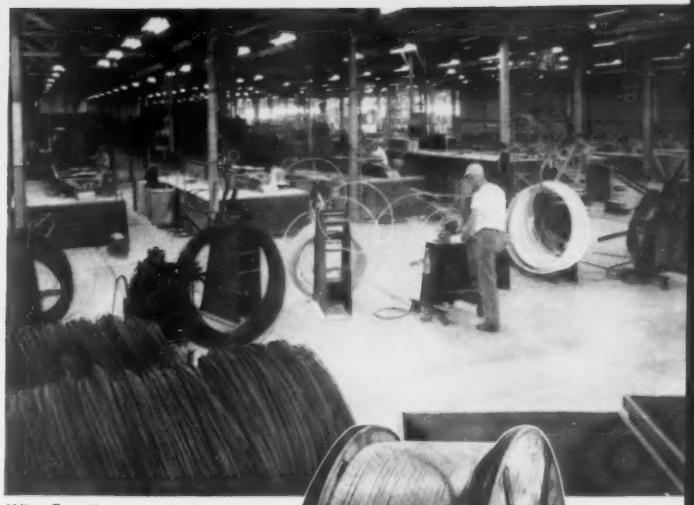
composed of bubbles having substantially the same size, and by mixing latex with it in such a manner that the bubbles of the soap froth are evenly coated with the latex and the even cellular structure of the soap froth is maintained.

As shown in the schematic diagram, the principal portion of the apparatus is supported by the upright posts (10) which rest upon the floor (11). These uprights are connected by the transverse braces (12). This structure supports a closed receptacle (13) having a cylindrical body which is closed at the lower end by a floor (14), and at the upper end by the rounded dome (15).

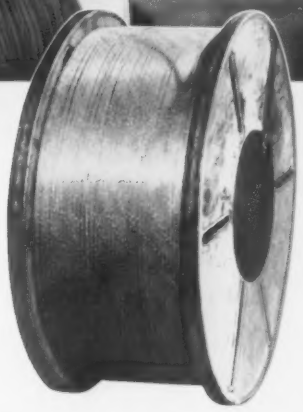


This receptacle (13) forms a closed frother and has a second floor (16), so as to form an air chamber between floors. The floor (16) is provided with a large number of hollow needles (17) that project upward a short distance from the floor as shown, and are spaced about ½-inch apart. The outside diameter of these needles, which is important as it controls the size of the bubbles, may vary from about .007 to .02 inch. The inside bore of the needles is less important and need not be more than about .008 inch in diameter. The action of these needles is such that when a frothing liquid, such as a soap solution, is deposited upon the floor (16) to a height above the level of the top of the needles, air or other gas, which is forced into the space between the floors (14 and 16) will pass upward through the needles (17) and through the soap solution on the floor (16). This produces a soap froth (F) that is highly uniform

Wire Patenting



Wire Drawing



Where economy in . . .

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You and we at National-Standard know that there's a lot about the quality and behavior of wire that cannot be determined by specifications or spot checks. It's possible, perhaps, but hardly practical.

And it's in this area of "immeasurables" that National-Standard methods, specialized experience, research and unusual control show up time and again to customers' advantage.

These advantages are *plus* economies that originate in the various National-Standard operations . . . from the exacting selection of basic materials, on through every step of processing, to the development of final surface and finish qualities.

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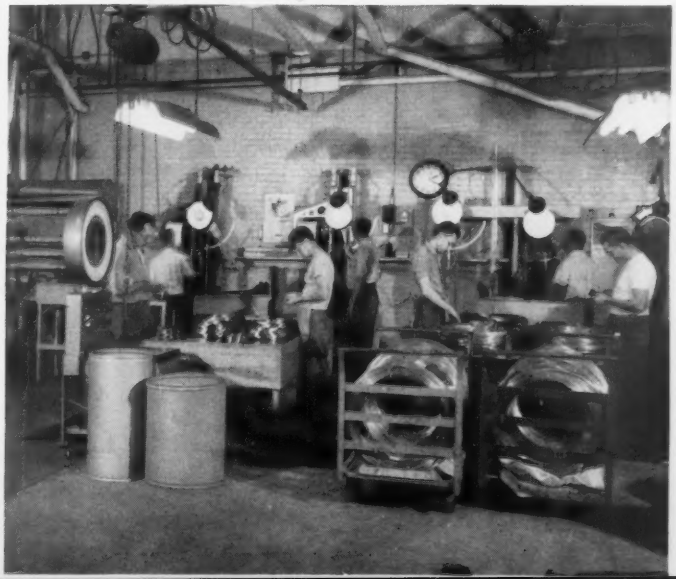
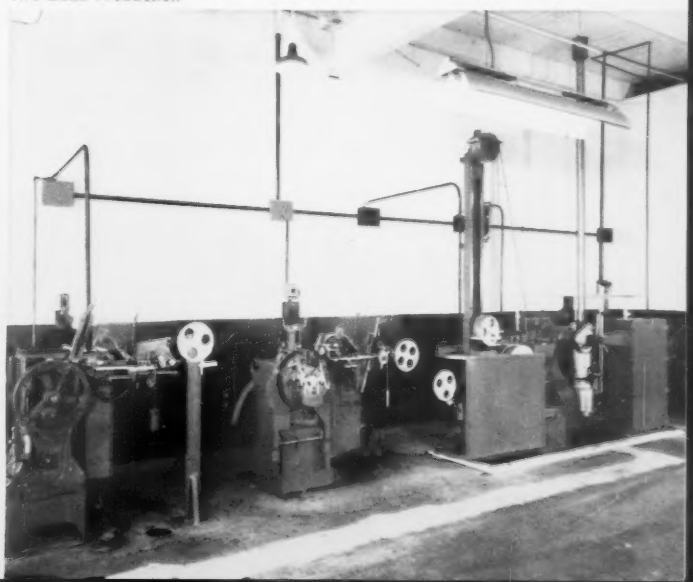
Inspection and Testing



Tire Bead Production



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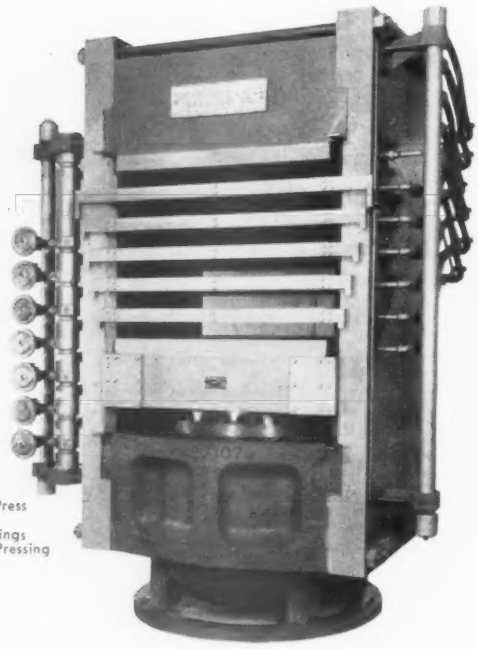

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6-3" Openings
40" x 40" Pressing
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Backed by many years of engineering and manufacturing experience, French hydraulic presses have a reputation for delivering high quality performance with an exceptional low cost maintenance record. Unsurpassed in workmanship, these presses are built to meet specific press room requirements and incorporate many outstanding features that assure a high level of consistent production. Of equal importance, however, is the attention given to the smaller, less conspicuous features of these presses. Features that add up to ease of operation, less wear and low cost maintenance. Yes, it will pay you to investigate French—your best investment in side plate molding presses. Send us your requirements, today!

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PATENT REVIEW

as to bubble size in sufficient quantity to fill the interior of the receptacle (13). This soap froth escapes from the receptacle through a central downwardly extending pipe. The upper end of this pipe terminates a short distance below the dome (15).

The soap froth is subjected, in the receptacle (13) to a greater than atmospheric pressure, for example, an added pressure of from 5 to 10 pounds. This will cause the froth (F) to pass down within the pipe (18) in a continuous stream as indicated by arrows. As the froth rises in the receptable (13), the excess soap solution can drain to the floor (16).

Before the latex is brought into contact with this soap froth, the froth is subjected to a shearing operation to reduce the size of the soap bubbles. This shearing mechanism is mounted in a casing (27) attached to the lower floor (14). The lower end of the pipe (18) leads to this casing. Within the casing (27) are a number of concentric circular rotating bands, with fixed bands positioned so that the rotating bands rotate between them.

The density of the soap froth will decrease as it progresses through the apparatus because the back pressure decreases and permits the soap bubbles to expand. The density of the soap froth on reaching the mixing area may be, for example, about .005 gram per cubic inch. The density of the liquid latex as it enters the mixing area is about 1.0. This very great difference in the density of the two materials makes it difficult to mix them thoroughly without crushing the soap froth. One highly desirable construction for intimately mixing the latex compound with the flowing stream of soap froth is shown. A supply of natural or synthetic latex containing the usual sulfur and other compounding materials is confined within a container (39) which is connected by a pipe (40) to a metering pump (41). This pump has leading from it a pipe (42) adapted to supply the latex to the stream of soap froth. The casing (27) in which the shearing mechanism is housed has extending downward from its lower wall a pipe (43), and within this pipe a latex distributing cup (44) is supported in a manner which enables it to rotate. This cup has outwardly flaring sidewalls, and it is concentrically secured to a driving shaft (45) which extends upward through the hollow shaft (34) and is supported from the upper end portion of the machine by a bearing (46) mounted on a support (47) and a gear (48) which is driven by a pinion (49). The pinion is driven at the desired speed by a variable speed mechanism mounted in the casing (50).

The latex feed pipe (42) extends inward through a hole in the side wall of the pipe (43) and into position to deliver its stream of latex into the cup (44). It is important to add a gelling agent to the latex at about the time it contacts the soap froth. This is done by providing a tank (51) containing a gelling agent. This tank is connected by a pipe (52) to a metering pump (53) which has leading from it a pipe (54) that com-

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PATENT REVIEW

municates with the latex feed pipe (42) so as to inject a metered amount of the gelling agent into the latex stream with a turbulent action, thereby causing the gelling agent to be mixed thoroughly with the latex before the latex enters the cup (44). During mixing, the latex is thrown outwardly, by the centrifugal force of the rotating cup, over the upper edge of the cup to contact the stream of froth moving downwardly along the inner walls of the pipe (43).

Reclaim Rubber for Hard Rubber Products

U. S. PATENT 2,809,944, issued October 15, 1957, to Edward F. Sverdrup, assigned to U. S. Rubber Reclaiming Co., describes a process for reclaiming rubber in such a manner that the reclaimed product may be revulcanized to produce hard rubber products.

The process consists of the reclaiming of vulcanized rubber by mechanical working and heat in the presence of substantial amounts of added free sulfur, and the revulcanization of the reclaimed product in the presence of additional sulfur. In this process, the heat facilitates a desirable preliminary cross-linking of the rubber molecules as the added sulfur combines with the rubber, while, at the same time, the mechanical action and heat plasticizes the rubber and maintains it in a plastic condition.

Other Patents Of Interest

Subject	Inventor or Assignee	Patent No.	Date
Rubber roll	Dayton Rubber Co.	2,804,678	9/3/57
Methods of toughening golf ball covers	United States Rubber Co.	2,805,072	9/3/57
Rubber latex compositions heat-sensitized with polyalkoxy-1-alkanols	General Aniline & Film Corp.	2,805,210	9/3/57
Rubber compositions stabilized with 6-diethylamino substituted 1,2-dihydroquinolines	Monsanto Chemical Co.	2,805,212	9/3/57
Molded diaphragm mat	Crane Co.	2,805,455	9/10/57

Copies of any patents, including those described here, are available from the Commissioner of Patents, Washington 25, D. C., for 25 cents each. Do not send stamps.

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R. D. Wood 2000 ton single opening molding press for the molding of abrasive wheels, and other similar molding and curing operations. Platen size—44" x 44". When molding abrasives, canvas boots protect columns and main ram from abrasive particles. Can be furnished with self-contained hydraulic pumping unit or arranged for accumulator operation.

R. D. WOOD COMPANY

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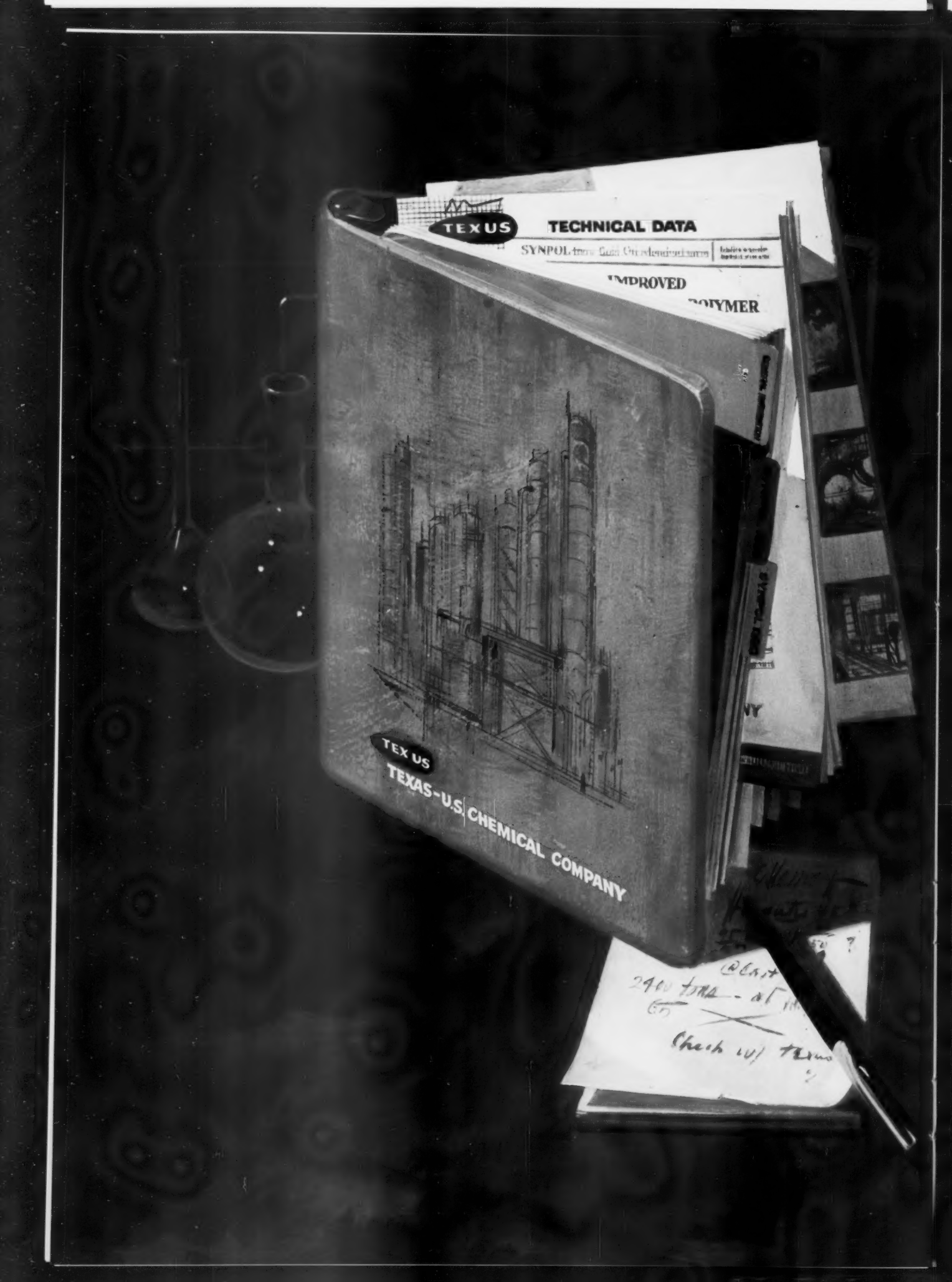
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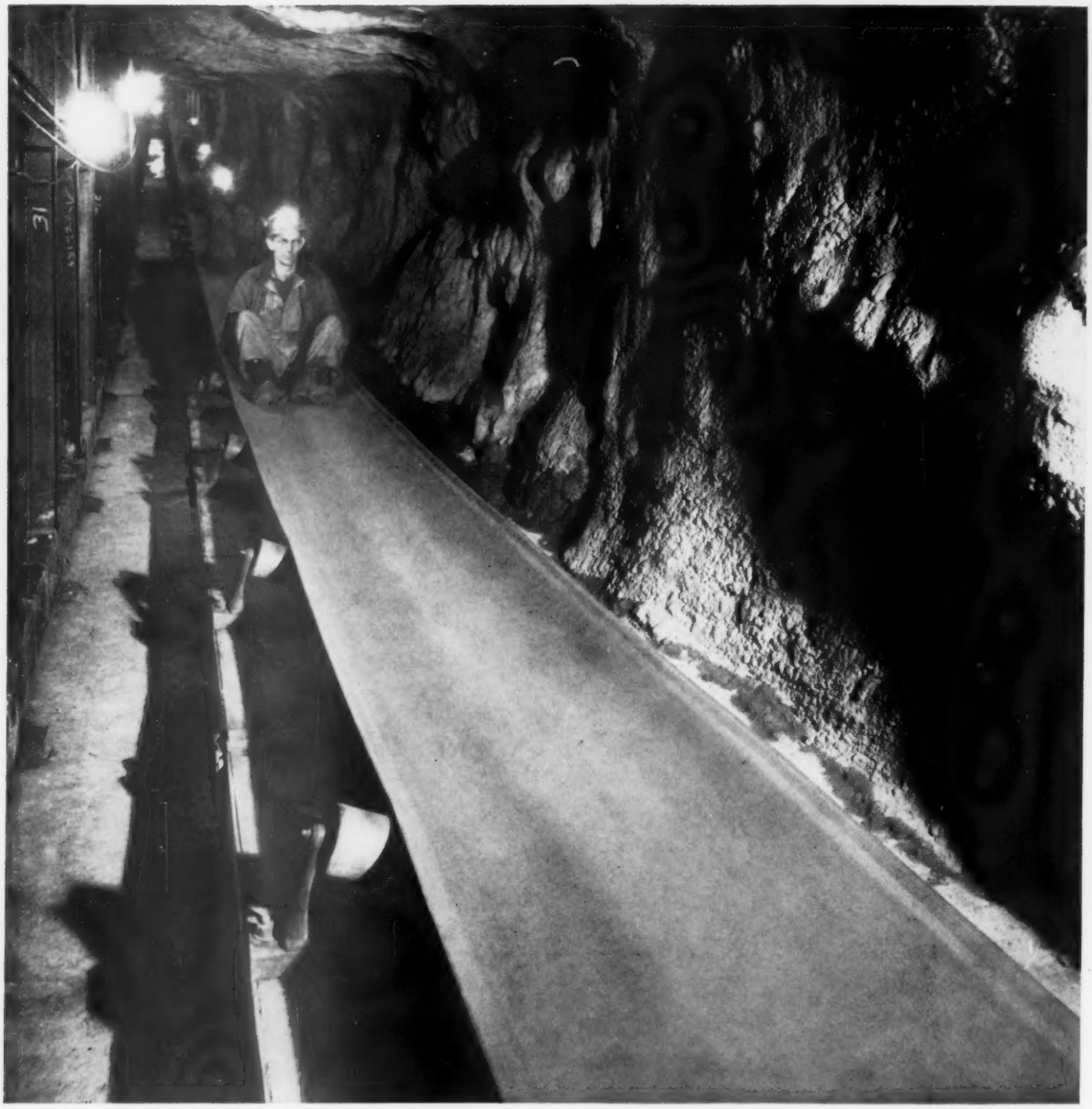

COMMUTER SERVICE—Crichton No. 4 mine at Panther Gulch, West Virginia, is a highly mechanized bituminous coal mining operation owned and operated by the Johnstown Coal & Coke Co., Inc., of Johnstown, Pennsylvania. Employing about 300 miners when in full operation, the mine is equipped with over eleven miles of conveyor belting to help facilitate various mining operations. Even the miners themselves travel on a unique, 450 ft. conveyor called a "manveyor." Installed along a 20% grade, the manveyor is capable of carrying up to 10 men a minute in or out of the mine, a speed which serves as an added safety factor as well. The 900 ft. of belting utilized for the manveyor was made by Hewitt Robins, Inc., from Mount Vernon fabrics.

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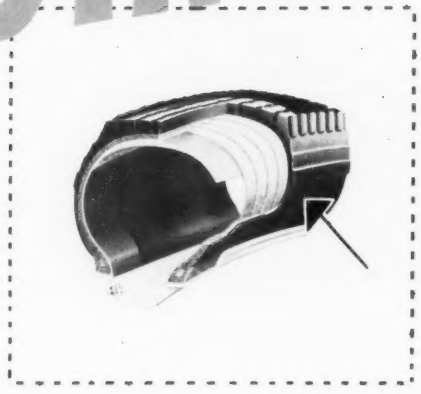

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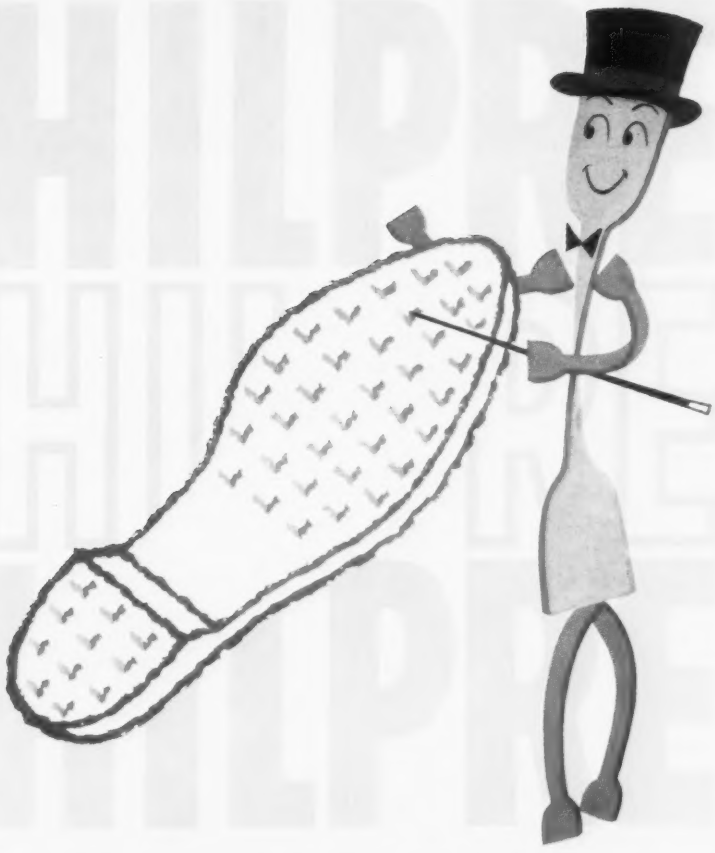

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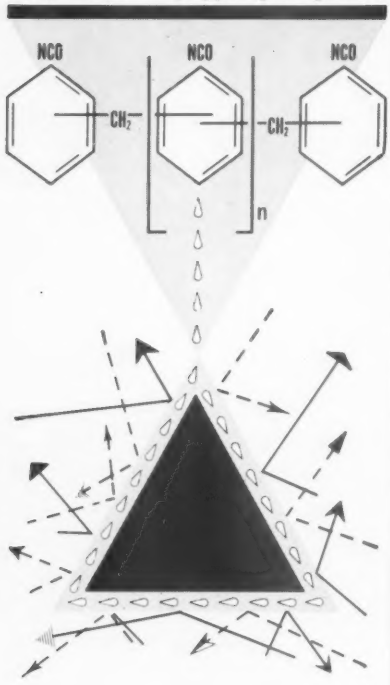

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COMING EVENTS

May 20. Elastomer & Plastics Group, A.C.S. Northeastern Section, Museum of Science, Boston, Mass.

May 21. Washington Rubber Group.

May 23. Connecticut Rubber Group, Manero's Restaurant, Orange, Conn.

May 28. Division of Rubber Chemistry, Chemical Institute of Canada, Annual Meeting, Royal York Hotel, Toronto, Ont., Canada.

June 5. New York Rubber Group, Summer Outing, Doerr's Grove, Millburn, N. J.

June 6. Fort Wayne Rubber & Plastics Group, Summer Outing, Lake Teppecanoe, Leesburg, Ind.

June 7. Southern Ohio Rubber Group, Summer Outing, Inland Activities Center, ter, Dayton, Ohio.

June 9-12. A.S.M.E. National Conference on Materials Handling, Public Auditorium, Cleveland, Ohio.

June 10. Buffalo Rubber Group, Summer Outing.

June 13. Boston Rubber Group, Summer Outing, Andover Country Club, Andover, Mass.

June 13-14. Southern Rubber Group, Dinkler Plaza Hotel, Atlanta, Ga.

June 20. Akron Rubber Group, Summer Outing, Firestone Country Club, Akron, Ohio.

June 22-28. A.S.T.M. Annual Meeting, Hotel Statler, Boston, Mass.

June 27. Detroit Rubber & Plastics Group, Summer Outing, Western Golf and Country Club, Detroit, Mich.

July 25. Chicago Rubber Group, Golf Outing, Medinah Country Club, Medinah, Ill.

Aug. 5. New York Rubber Group, Golf Outing, Wingfoot Golf Club, Mamaroneck, N. Y.

Aug. 22. Philadelphia Rubber Group, Golf Outing.

Sept. 6. Connecticut Rubber Group, Summer Outing.

Sept. 10-12. Division of Rubber Chemistry, A.C.S., Fall Meeting, Hotel Sherman, Chicago, Ill.

Sept. 19. American Society for Quality Control, San Francisco Bay Area Quality Control Conference, Stanford, Calif.

Sept. 25. Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

Oct. 3. Detroit Rubber & Plastics Group, Fall Meeting, Detroit-Leland Hotel, Detroit, Mich.

Oct. 7. Los Angeles Rubber Group, Biltmore Hotel, Los Angeles, Calif.

Oct. 9. Southern Ohio Rubber Group, Fall Technical Meeting, Gibbons Hotel, Dayton, Ohio.

Oct. 14. Buffalo Rubber Group, Hotel Westbrook, Buffalo, N. Y.

Oct. 16. Boston Rubber Group, Fall Meeting, Hotel Somerset, Boston, Mass.

Oct. 17. New York Rubber Group, Fall Meeting, Henry Hudson Hotel, New York, N. Y.

Oct. 17-18. Southern Rubber Group, Roosevelt Hotel, New Orleans, La.

Oct. 24. Philadelphia Rubber Group, Poor Richard Club, Philadelphia, Penna.

Oct. 24. Akron Rubber Group, Sheraton Hotel, Akron, Ohio.

Nov. 14. Connecticut Rubber Group.

Nov. 17-21. Society of the Plastics Industry Annual National Conference, Morrison Hotel, Chicago, Ill.

Nov. 30-Dec. 5. A.S.M.E. Annual Meeting, Hotel Statler, New York, N. Y.

Dec. 2. Buffalo Rubber Group, Xmas Party.

Dec. 4. Fort Wayne Rubber & Plastics Group, Van Orman Hotel, Fort Wayne, Ind.

Dec. 12. Detroit Rubber & Plastics Group, Xmas Party, Sheraton-Cadillac Hotel, Detroit, Mich.

Dec. 12. New York Rubber Group, Xmas Party.

Dec. 13. Southern Ohio Rubber Group, Winter Meeting, Miami Valley Country Club, Dayton, Ohio.

May 12-15, 1959. Division of Rubber Chemistry, A.C.S., Spring Meeting, Biltmore Hotel, Los Angeles, Calif.

Nov. 9-13, 1959. Joint International Meeting of Division of Rubber Chemistry, A.C.S.; Committee D-11, A.S.T.M., and Rubber and Plastics Division, A.S.M.E., Shoreham Hotel, Washington, D. C.

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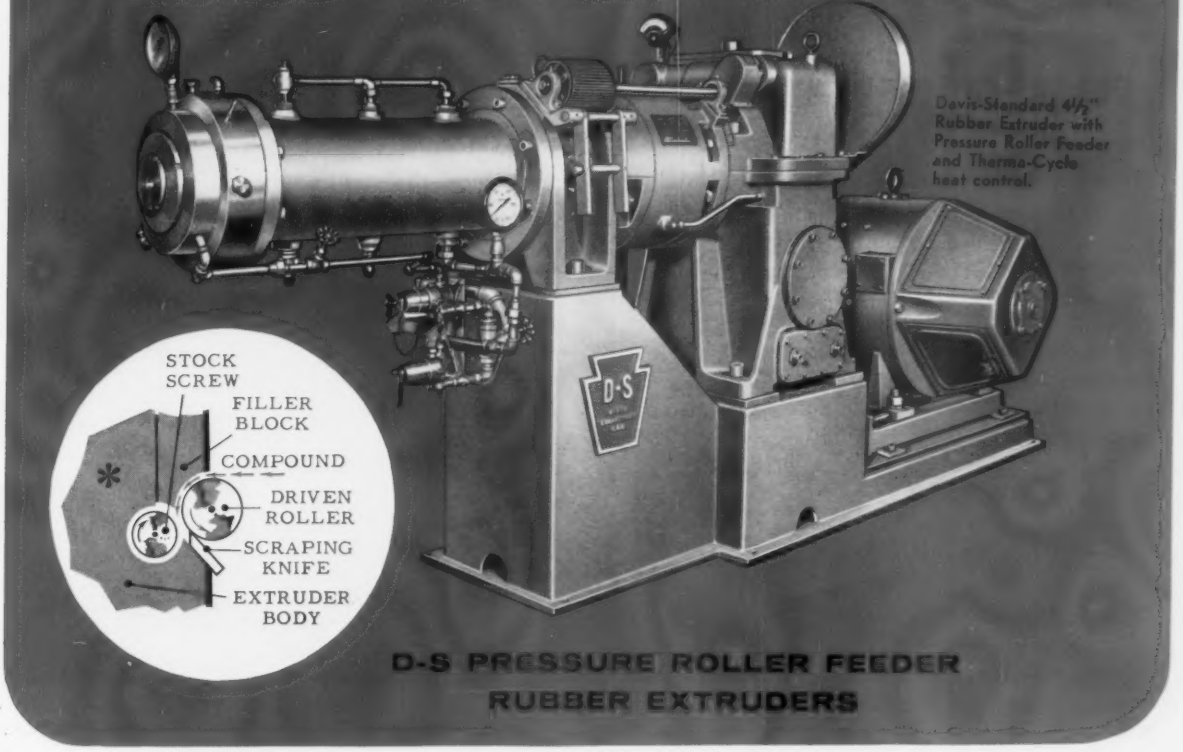

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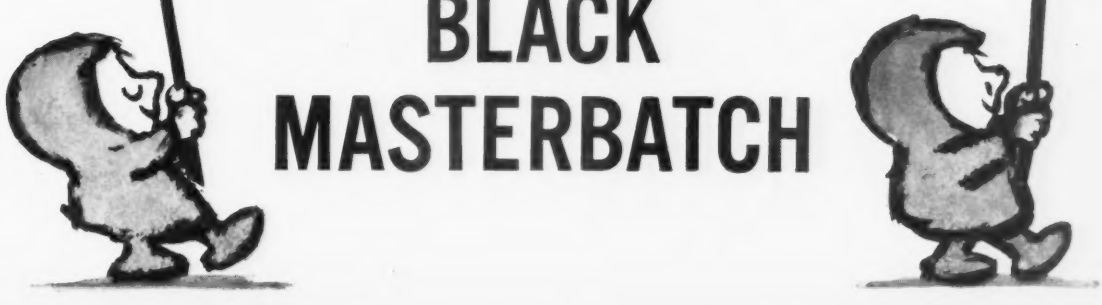
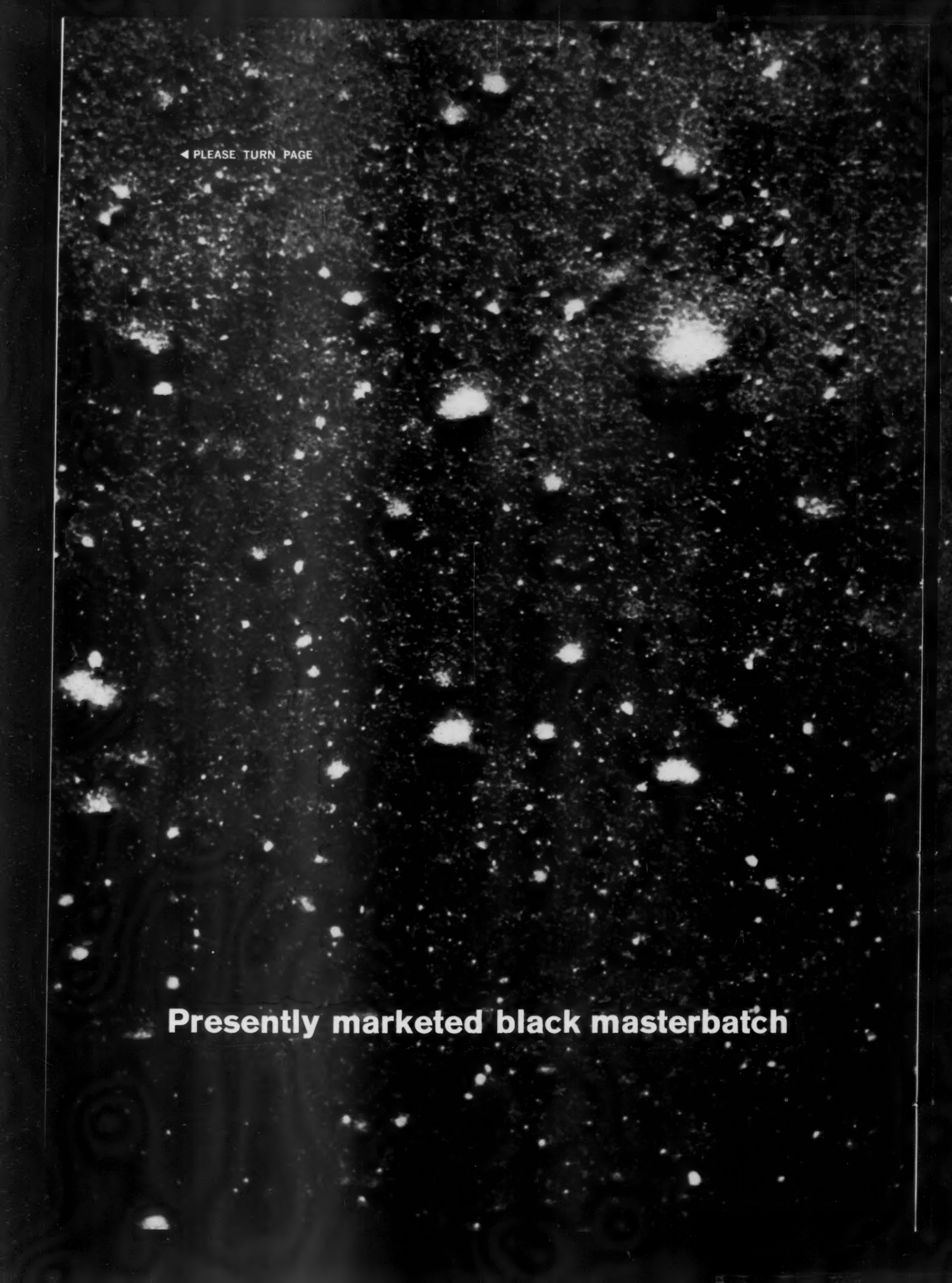
THE FIRST COMMERCIAL SUPER-DISPERSED PREMIUM QUALITY BLACK MASTERBATCH




◀ PLEASE TURN PAGE
Presently marketed black masterbatch

PLEASE TURN PAGE ▶
New Super-dispersed Carbomix 3750

ON THE PRECEDING 2 PAGES

are unretouched photomicrographs (50 X magnification) of two actual **single-pass** factory mixed tread stocks. On the left is a stock mixed from a presently-marketed black masterbatch. On the right is a stock mixed in identical manner from the new Carbomix 3750 black masterbatch.

The obviously superior black dispersion in the Carbomix 3750 stock is the result of COPOLYMER'S **pioneering** and **research** in the field of black masterbatches over the past ten years. The COPOLYMER super-dispersion process is unique in the industry and uses no chemical dispersing agent.

Carbomix 3750 is the first of a new family of super-dispersed black masterbatches.

WHAT DOES THE NEW CARBOMIX 3750 MEAN TO YOU?

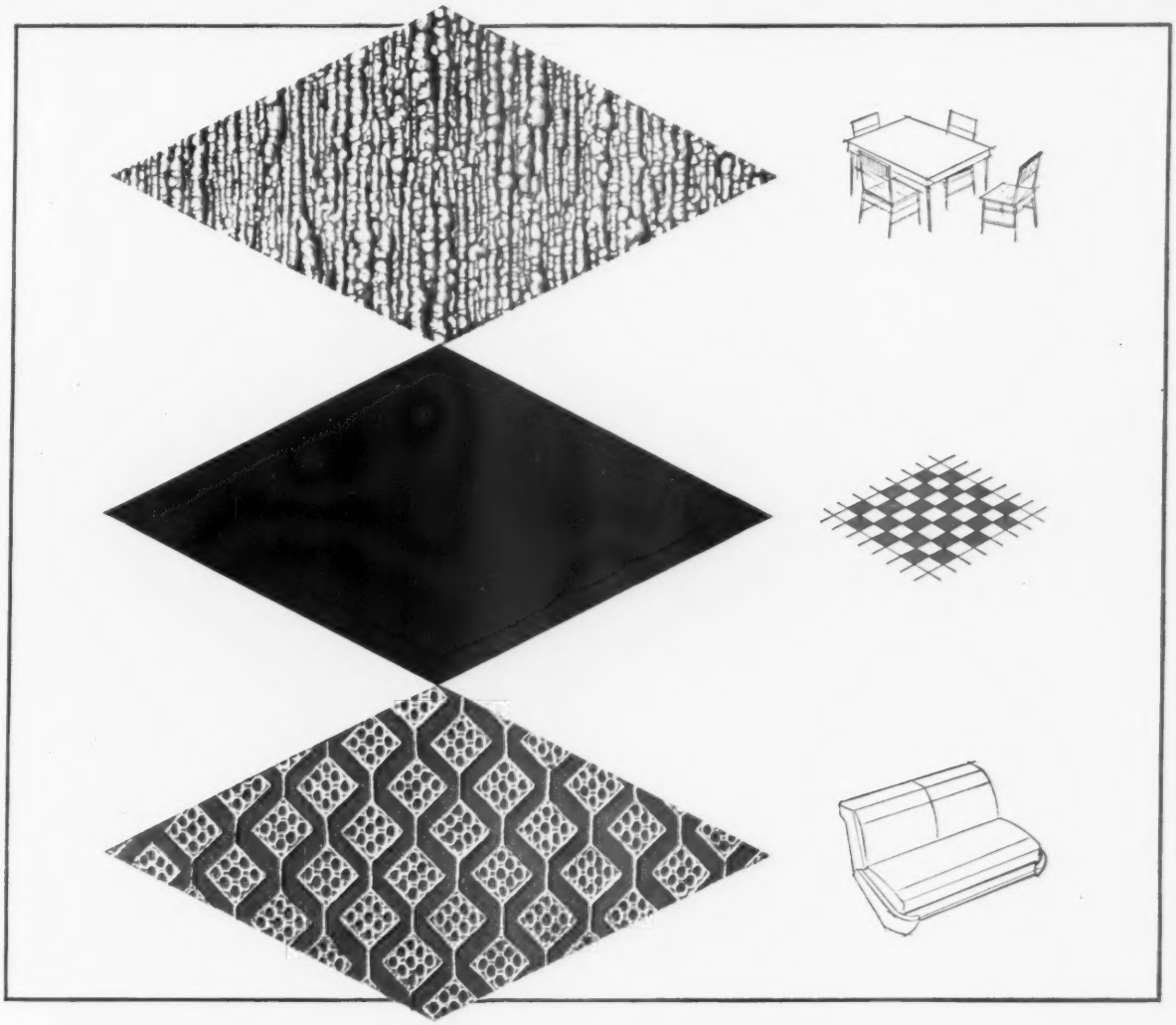
- Mixing Economy
- Lower mixing temperatures
- Improved physicals
- Superior product performance
- Cleaner plant operation

and at no additional cost.

For technical data or samples—please write us.

COPOLYMER RUBBER & CHEMICAL CORP. · BATON ROUGE, LA.

F. L. ATKINSON, SALES MANAGER



Plastolein® 9720 is the answer to low-cost polymeric permanence!

Only a polymeric plasticizer can give your vinyl products the permanence your customers want. And of all polymerics, Plastolein 9720 is the lowest in cost.

You get versatile all-around utility from Plastolein 9720. Outstanding permanence. Easy processability. High efficiency. Excellent compatibility. You get low temperature flexibility that other polymerics fail to match. And the comparatively low viscosity of Plastolein 9720 provides added savings from bulk storage and easy handling.

Remember, Plastolein 9720 gives you polymeric *permanence*, at the lowest possible cost. Get the facts by sending the coupon below.

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Emery Industries, Inc., Dept. U-5,
Carew Tower, Cincinnati 2, Ohio
Please send 32-page Emeryfacts describing the Plastolein Plasticizers.

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ROSS Air Systems

Engineered Atmospheres for Better Processing

This refers to a foam rubber processing installation . . . a 65 foot long by 8 foot wide Ross Continuous Dryer and Curing Unit for drying C-Foam mattresses, furniture and aircraft cushions at the American Latex Corp. plant, Hawthorne, California.

Twenty minutes of the 45 minutes total continuous processing time are critically important because it is the curing period. Here is where the carefully conceived and controlled 'Engineered Atmosphere' comes into the picture. The temperature in this zone has to be held very close to 240°F by specially designed introduction, circulation and exhausting of hot air. Timing of travel has to be just right.

20 critical minutes at 240°F

Approaching the discharge end comes a complete reversal . . . a cooling zone, where residual hot spots, which could cause spontaneous combustion of the material in storage, are eliminated by the controlled introduction and circulation of cool air.

In this installation, there are at least four important elements of an 'Engineered Atmosphere': zoning, circulation of hot air, temperature control and cooling . . . all precision problems. Drying, curing, baking, impingement, heating, cooling . . . these are typical of the operations on which Ross Engineers have concentrated their skills for more than thirty-seven years.

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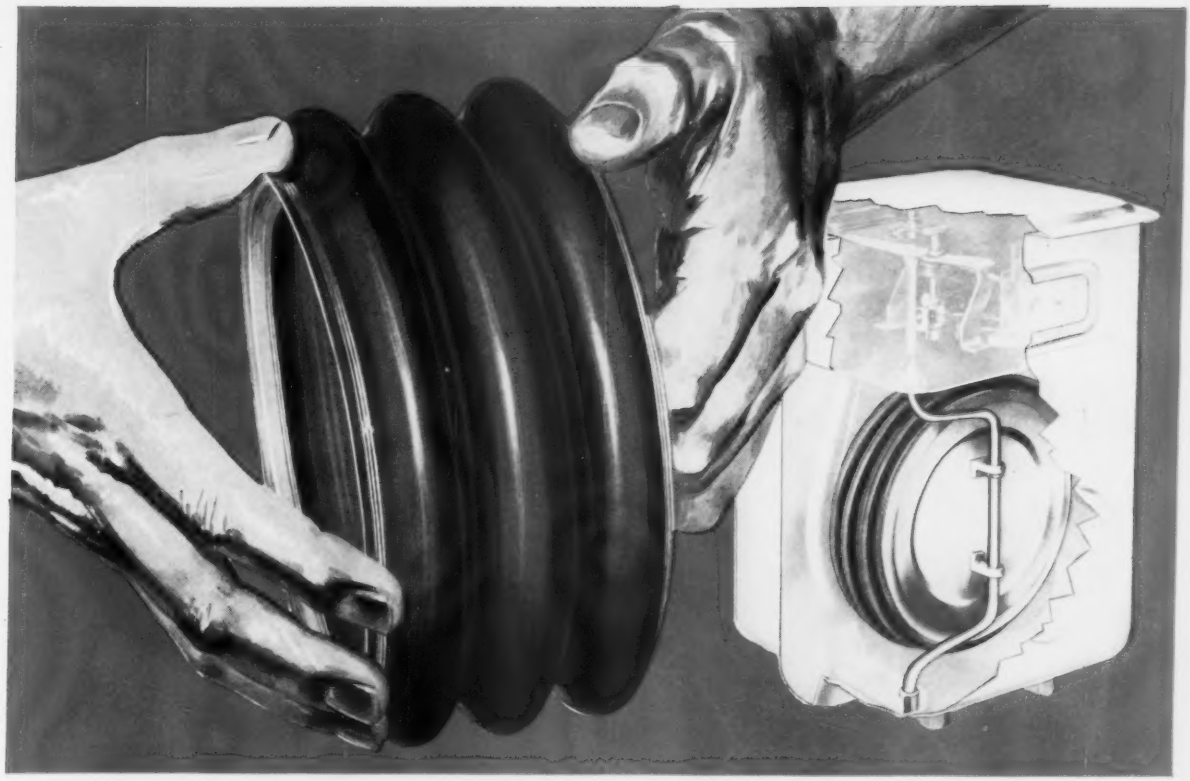

Thiokol® ST PROVIDES LONGER LASTING... MORE EFFICIENT DIAPHRAGMS

Diaphragms coated with THIOKOL'S ST have

- **greatest resistance to most gases and solvents**
- **very low permeability to vapors and liquids**
- **maximum low temperature flexibility**

Because of these outstanding properties, major improvements are being made in diaphragms. For example, gas meter diaphragms are now being made with cotton, coated with THIOKOL's Type ST that last longer and are more efficient than conventional diaphragms. THIOKOL Polysulfide Rubber Type ST provides maximum resistance against chemicals and solvents either in condensate or gaseous form. These coated diaphragms are absolutely air-tight and gas-tight. There is no "dressing" on this type of diaphragm which can leach out and cause the diaphragm to become stiff. Because of the increased performance and uniformity of material coated with THIOKOL's ST, thinner diaphragms are being used with more rapid cycling movements enabling the size of the unit to be reduced.

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In Canada: Naugatuck Chemicals Division, Dominion Rubber Co., Elmira, Ontario

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FOR MORE INFORMATION, mail coupon to Dept. 11, Thiokol Chemical Corporation, 780 North Clinton Ave., Trenton 7, New Jersey.

Gentlemen: Please send me further details about THIOKOL Polysulfide Synthetic Rubber.

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BUILD THE PATTERN OF A TIRE TREAD

Tire tread designs are patterns with a purpose. Years of research by the tire industry has proven every slot, every angle to be the most efficient . . . to offer the most in road holding with a minimum of wear. This is no small contribution to safer, surer transportation.

Those thousands of thin grooves are difficult to make . . . still, they provide the "biting edge" for safe stops. Molded in standard equipment with extremely thin section molds, the grooves are made possible because of the easy release properties of UNION CARBIDE Silicones. And, production is increased, rejects are reduced. One manufacturer, after eight years of experience, states: "Silicones reduce blemishes on treads, permit complicated treads not possible without silicones, and eliminates mold cleaning."

This is another example of how the UNION CARBIDE Silicones Man has helped solve an "impossible" problem . . . why UNION CARBIDE is one of the leading suppliers of silicone release agents for the rubber industry. For details, contact our distributor, C. P. Hall Co., with offices in Newark, N. J., Chicago, Ill., Akron, Ohio, Memphis, Tenn., and Los Angeles, Calif., or write Dept. RA-5, Silicones Division, Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.

UNION CARBIDE TRADE-MARK SILICONES

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Capitol Cues

THE START OF A BUSINESS UPTURN still isn't in sight, despite all the reassuring words from government officials and the anti-recession actions taken. Nevertheless, leading economists feel that the turnaround will come before this year is over—some time in the next six or nine months or so. But—because recovery will be gradual--anti-recession action will be needed.

Why late 1958? By that time, the pluses in the outlook will be outweighing the minuses. The pluses will include rising government spending—for defense and recession programs—and renewed inventory buying by industry. Among the minuses, there's the slump in business spending for new plant and the consumer's reluctance to buy autos and other hard goods.

THE DECLINE IN FACTORY OUTPUT WILL SLOW DOWN some in the next two or three months. The drops have been averaging 2% during the last half-year—from the August-September high of 147% of the 1947-49 average to 130%. From now on, industrial production may drop little more than 1% each month. The index may level out at approximately 124 or 125 by the middle of the year.

- In hard goods, where falls averaged a sharp 4% a month, the moderating will be considerable. Drops will run 1% to 2%—centering in automobiles, machinery, and non-ferrous metals.
- In soft goods, the index will fall less than the recent 1% a month. Oil, chemicals, and rubber will lead the way down.

After midyear, economists see a halting upturn—maybe a point or so a month for several months. What happens after that depends on what anti-recession measures the government takes.

WASHINGTON'S ANTI-RECESSION EFFORTS are now beginning to add up to a good-sized program. Clearly, it will provide some lift to business in the second half of this year--and thereafter. The question is: How much lift? Economists who analyze the new and stepped-up federal projects come to this conclusion: Without a tax cut, anti-recession action won't mean much in '58.

Here's what NON-TAX proposals will do for business:

- Home-building—Direct lending and mortgage buying under the Sparkman law will lift spending rates by $1 billion a year.
- Public works—The long lead-times involved will permit only a $500 million hike in funds for roads, dams, post offices.
- Jobless pay—Extra benefits will run $500 million a year.
- Defense spending—Anti-recession efforts may lift the rate of Pentagon outlays by $700 million a year over early plans.
- Nondefense buying—Stepped-up procurement of "housekeeping" items will boost second-half spending rates by $300 million.

Put all this together, and you get a $3 billion-a-year total. That's not considered likely to stimulate business very much.

Tax cuts can make the picture more encouraging. If Congress cuts by $6 to $8 billion, at least $5 billion would be spent by businesses and consumers for a whole range of goods. All told, then, the anti-recession program would add up to an $8 billion program. Its business impact could fan out to twice this, and bring economic activity back to near recent peaks.

(Continued on Next Page)

THERE'S STILL OPPOSITION TO TAX CUTS from many important government officials. Most of all, they fear the inflationary hangover that reductions will generate in a year or so. But some feel that cuts won't be necessary, anyway, since they hope that business will improve without much stimulation from Washington. As for the politics of cuts, these men say this factor has been highly overrated. The GOP cut in '48 and '54—then lost Congress.

Supporters of tax reduction, however, feel that the dominant consideration is a need to check the contraction in consumers' income and spending. They feel that there's real danger the slide may accelerate and turn into a serious downward spiral. This view is widely held in Congress and by many economists.

A HUGE FEDERAL DEFICIT—maybe the biggest since the war—is in sight for fiscal 1959. This year—fiscal 1958—the deficit will be $1.5 billion. Next year, the red ink could well reach a whopping $10-$12 billion or more. This prospect is still another argument against large tax reductions now.

- Revenues will slip with incomes and profits. The Treasury's receipts will be $70 billion, not the $74.4 billion predicted. And if those taxes are cut, revenues will fall billions more.
- Spending—defense and anti-recession—will conservatively top the President's Budget of $73.9 billion by $3 or $4 billion.

BUSINESS FAILURES WILL RISE FAST in 1958 because of the recession. They're already running more than 10% ahead of comparable periods of 1957. But in the last two downturns—1948-49 and 1953-54—failures rose over 25%. And history may well repeat itself. If it does, failures could top 17,000. Last year, the total reached 13,700; back in 1939, the figure was 14,800.

THE FOREIGN EFFECTS OF THE RECESSION have been very mild thus far. That's a good sign, since it means those we trade with won't have to slash their buying here on a wholesale scale—a development that would feed back and depress U.S. business. But things could get worse. Indeed, the other countries fear that a vicious cycle could start with every nation cutting its buying and finding its own foreign sales curtailed, as a result.

Here's the world picture as it stands now:

- In Britain, employment and producton are near peak levels, but signs of leveling...and unemployment...are showing up.
- In Germany, industrial output is still climbing—at a slow rate—though reduced U.S. orders are hurting steel firms.
- In France, the big problems are domestic and political. War spending in Algeria is booming production——and inflation.
- In Switzerland, business is so good, activity is under curb.
- In Latin America, falling metal prices are hurting Chile and Bolivia. Most other countries are mainly nervous so far.
- In Southeast Asia, our falling imports of raw materials are causing distress in Malaya, Indonesia, the Philippines.
- In Japan, the economy has been fairly heavily hit by the dip in the U.S. Unemployment is rising fast. The country is now planning a big drive to expand markets for exports.
- In Canada, conditions are much like those in this country—maybe worse. Big anti-recession programs are being planned.

Polysar Latex 721
...a new foam latex

Available now, from Polymer's new latex plant—*Polysar Latex 721—a high solids, large particle size, styrene-butadiene latex designed for use in foam rubber.

Polysar Latex 721 gives you better ageing qualities . . . less mould shrinkage . . . a more uniform latex composition than natural rubber latex, together with excellent mechanical and storage stability. It is completely compatible with natural rubber latex and results in the same good cushioning characteristics because the load carrying capacities are essentially equivalent. Used in combination with natural rubber latex, this new Polysar latex promotes rapid, fluid foam formation to give you good moulding qualities.

Polysar Latex 721 is ideally suited to moulded applications, such as automotive seating, mattresses and pillows. It also offers important product advantages to manufacturers of sheet and slab stock for the furniture industry. The uniform particle size of Polysar Latex 721 should also prove useful to processors of various latex-based adhesives and coatings.

For complete data concerning the properties and application of Polysar Latex 721, write to our Sales and Technical Service Division.

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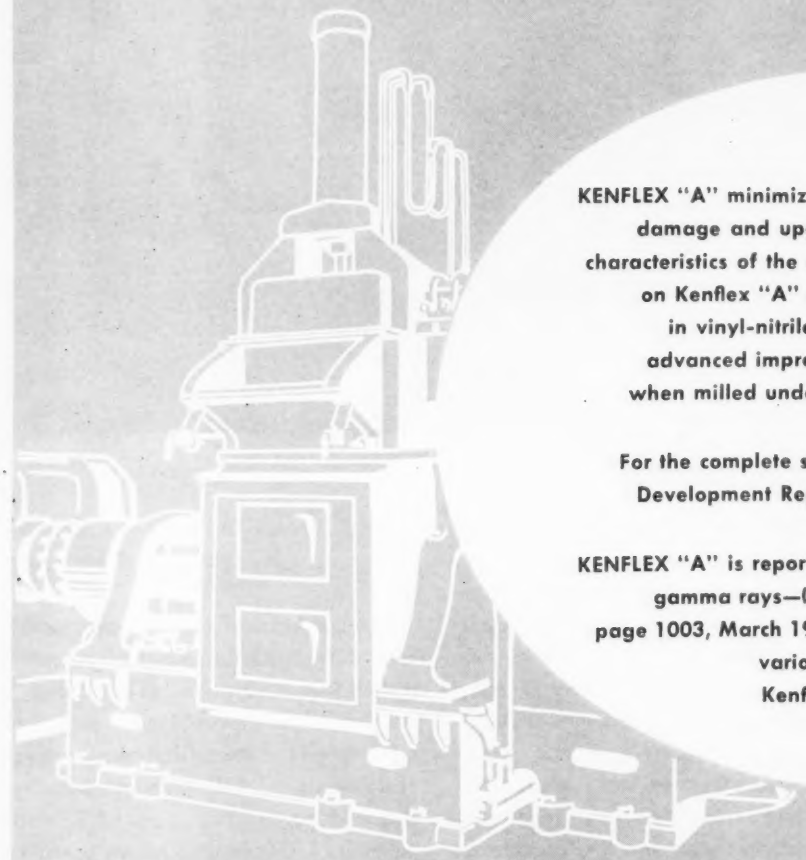
Kenflex "A" ...for compatibility, ozone resistance in vinyl-nitrile rubber



KENFLEX "A" minimizes static and dynamic ozone damage and upgrades physical and general characteristics of the compound. Technical studies on Kenflex "A" as the mutual solvent or flux in vinyl-nitrile rubber production, indicate advanced improvement in ozone resistance, when milled under recommended procedures.

For the complete study, write for our Technical Development Report on Vinyl-Nitrile Rubber.

KENFLEX "A" is reported to protect polymers from gamma rays—(See Rubber Age, Volume 82, page 1003, March 1958). In Hypalon compounds, various antiozonants failed while Kenflex "A" provided protection.

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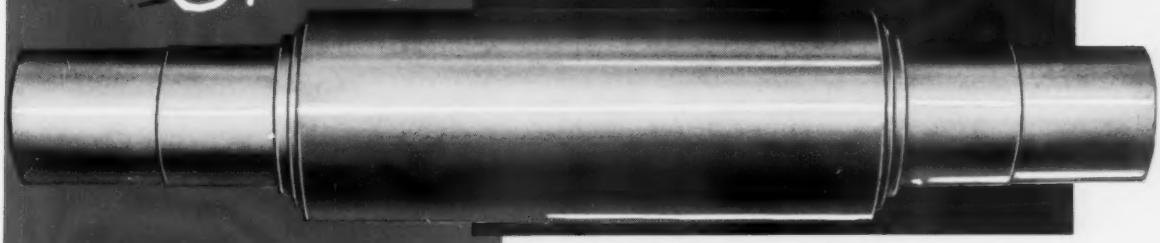
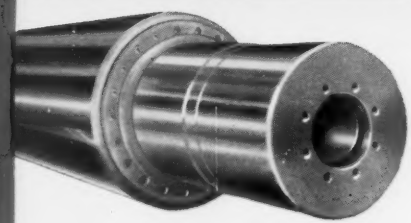
DRILLED-TYPE ROLLS





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UNITED Precision Ground, DRILLED-TYPE ROLLS, the result of careful metallurgical control over raw materials, and of strict quality control in every phase of manufacture . . .

MAINTAIN A UNIFORM ROLL SURFACE TEMPERATURE throughout, with minimum deviation at any point.

ASSURE FULL RANGE HEATING and cooling over wide temperature ranges.

PROVIDE ACCURATE, QUICKLY RESPONSIVE TEMPERATURE CONTROL.

UTILIZE FULL ROLL FACE with new, ring closure type designs.

PERMIT ADJUSTMENT OF RING CLOSURE GASKET AND BOLTS, WITH ROLL IN PLACE in calender or mill, thus eliminating production downtime due to roll removal.

MAINTAIN CORRECT DEPTH OF CHILL for iron or alloy iron rolls.

ARE ENGINEERED AND DESIGNED FOR MAXIMUM HEAT TRANSFER RATE with accurately drilled, fluid passages.

Our more than 50 years' experience in the design and manufacture of rolls can be helpful in solving your processing problems. Your inquiry is solicited.

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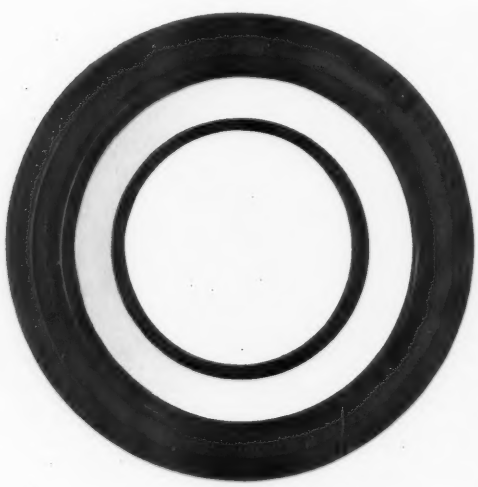
HI-SIL® PUTS EXCITING

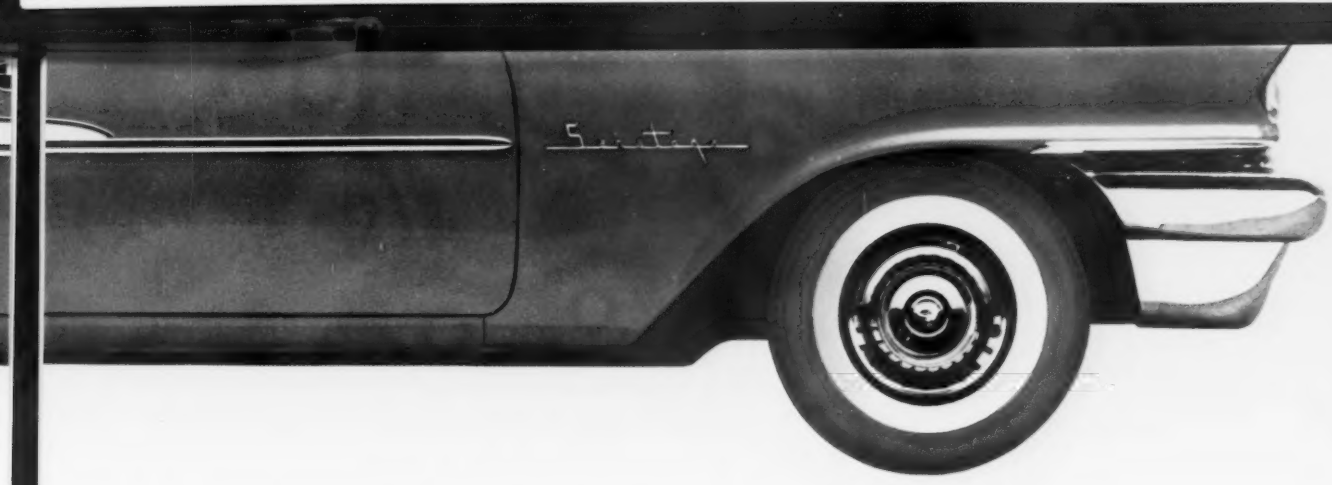
Here is dramatic proof that color stands ready to hurdle another old barrier. This is an actual photograph of the world's first practical colored tires.

Laboratory-made by our Barberton rubber research staff, the solid-color treads and sidewall veneers were then applied to conventional white sidewall undertreads. Building and curing were accomplished in conventional factory tire equipment.

Run against first-line black tires as controls, similar tread stocks have given an excellent account of themselves in extensive road tests. A brief write-up, which will answer some of the many questions about Hi-Sil 233 in this startling new application, is available

COLUMBIA-SOUTHERN





NEW COLOR INTO TIRES

for the asking. Just address Room 1929 at One Gateway Center.

Because Hi-Sil has very low covering power in rubber, the true deep tones . . . the vivid brights . . . the subtle pastels you see here are only a few of the unlimited color choices available to match or contrast with *any* background.

Doesn't the demonstrated performance of Hi-Sil 233 in critical applications like this suggest it as the answer to your quality colored goods problems?

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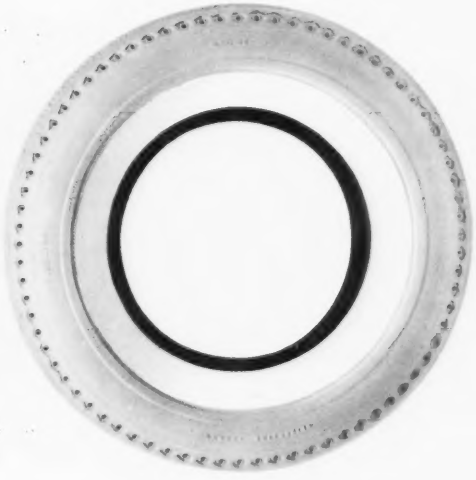
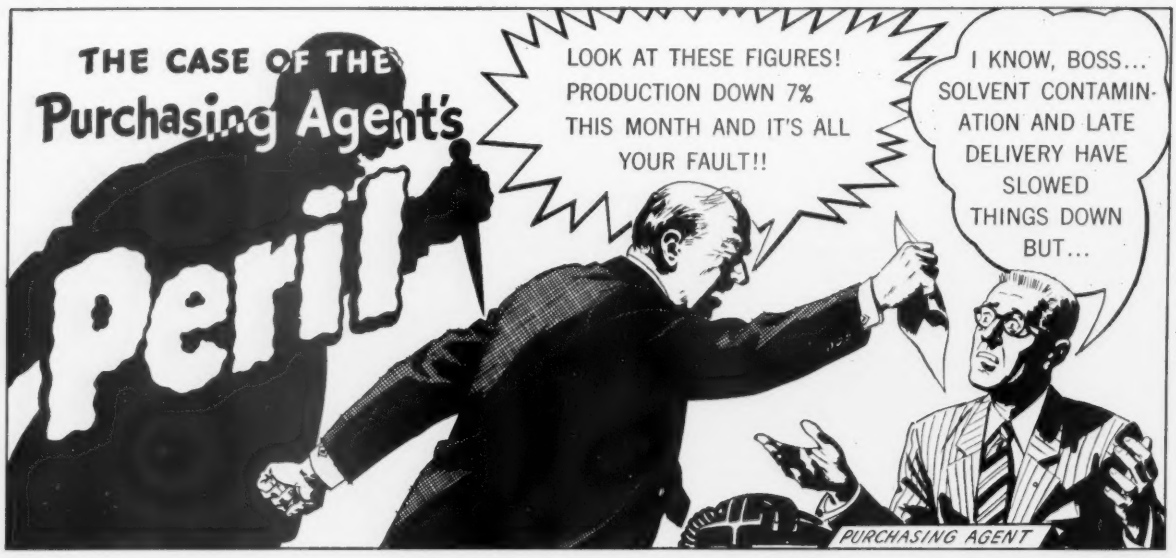
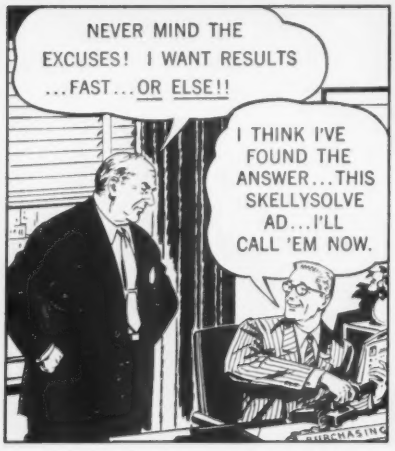
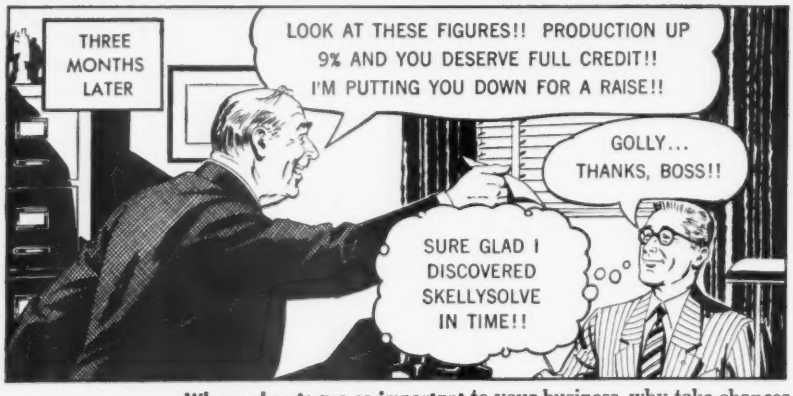


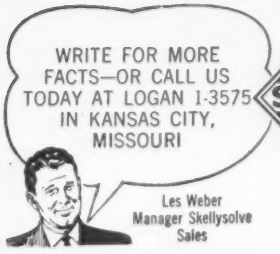

THE CASE OF THE
Purchasing Agent's
Peril
LOOK AT THESE FIGURES! PRODUCTION DOWN 7% THIS MONTH AND IT'S ALL YOUR FAULT!!
I KNOW, BOSS... SOLVENT CONTAMINATION AND LATE DELIVERY HAVE SLOWED THINGS DOWN BUT...
PURCHASING AGENT



...AND YOU SAY SKELLYSOLVE IS CONSTANTLY CHECKED DURING PRODUCTION AND BEFORE SHIPMENT?
RIGHT! AND NINE OUT OF TEN CARS ARE SHIPPED THE DAY AFTER THE ORDER IS RECEIVED!!


THREE MONTHS LATER
LOOK AT THESE FIGURES!! PRODUCTION UP 9% AND YOU DESERVE FULL CREDIT!! I'M PUTTING YOU DOWN FOR A RAISE!!
GOLLY... THANKS, BOSS!!
SURE GLAD I DISCOVERED SKELLYSOLVE IN TIME!!

When solvents are so important to your business, why take chances on quality or delivery? Next time you order specify Skellysolve.



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SKELLY OIL COMPANY

Industrial Division

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Skellysolve for Rubber and Related Industries

SKELLYSOLVE-B. For making quick-setting cements for the shoe, tape, container, tire and other industries. Quick-drying, with no foreign taste or odor in dried compound. Closed cup flash point about —25°F.

SKELLYSOLVE-C. For making quick-setting cements with a somewhat slower drying rate than those compounded with Skellysolve-B. Closed cup flash point about 13°F.

SKELLYSOLVE-H. For general use in manufacturing operations and cements, where faster evaporation rate than that of Skellysolve-C is desired. Closed cup flash point about —16°F.

SKELLYSOLVE-L. For general manufacturing operations where a medium evaporation rate is required. Closed cup flash point about 12°F.

SKELLYSOLVE-R. For general use in tire building and a variety of other manufacturing operations and cements. Reduces evaporation losses. Medium quick final dry. Lessens bloating and skinning tendency. Closed cup flash point about —25°F.

Ask about our new Skelly Petroleum Insoluble Grease.

Why permanently-attached couplings?

Four good answers spell better service . . . bigger profits!

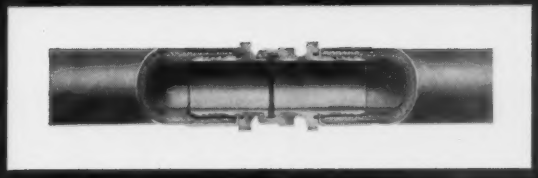
A PERMANENTLY-ATTACHED COUPLINGS COST LESS. And because modern hose is so good . . . lasts so long . . . re-attachable couplings need replacement at about the same time hose does.

A CONTINUING ECONOMY WITH PERMANENTLY-ATTACHED COUPLINGS. Hidden expenses—time, paper work, packing, shipping, etc.—involved in reconditioning of re-attachable couplings eliminated.

A MACHINE-ATTACHMENT ASSURES A MORE PERFECT FIT. Permanently-attached couplings are machine-fitted by experts. You get a permanently fitted coupling every time.

A LEAK-PROOF WITH FULL-FLOW DIAMETER INSIDE. Scovill permanently-attached couplings are made from solid brass forgings and seamless drawn copper tubing to form a strong leak-proof assembly.

For fuel-oil hose . . . permanently-attached couplings by **SCOVILL**



For complete specifications on fuel oil hose couplings write to Scovill Manufacturing Co., Merchandising Division, 88 Mill St., Waterbury 20, Conn. Ask for Bulletin No. 520-H.

The lighter side of rubber and plastics . . . colorwise, of course . . . is achieved through TITANOX* white pigments: TITANOX-RA, TITANOX-RA-50, and TITANOX-RA-NC (rutile titanium dioxides), and, for certain rubber compounds such as white sidewall stocks, TITANOX-AMO (anatase titanium dioxide).

Here's why: these leading white pigments lighten and opacify colors, whiten and opacify white stocks, regulate translucency or opacity, and contribute to durability. In addition, they lighten the burden of processing through ease of dispersion and uniformity of all properties. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; offices and warehouses in principal cities.

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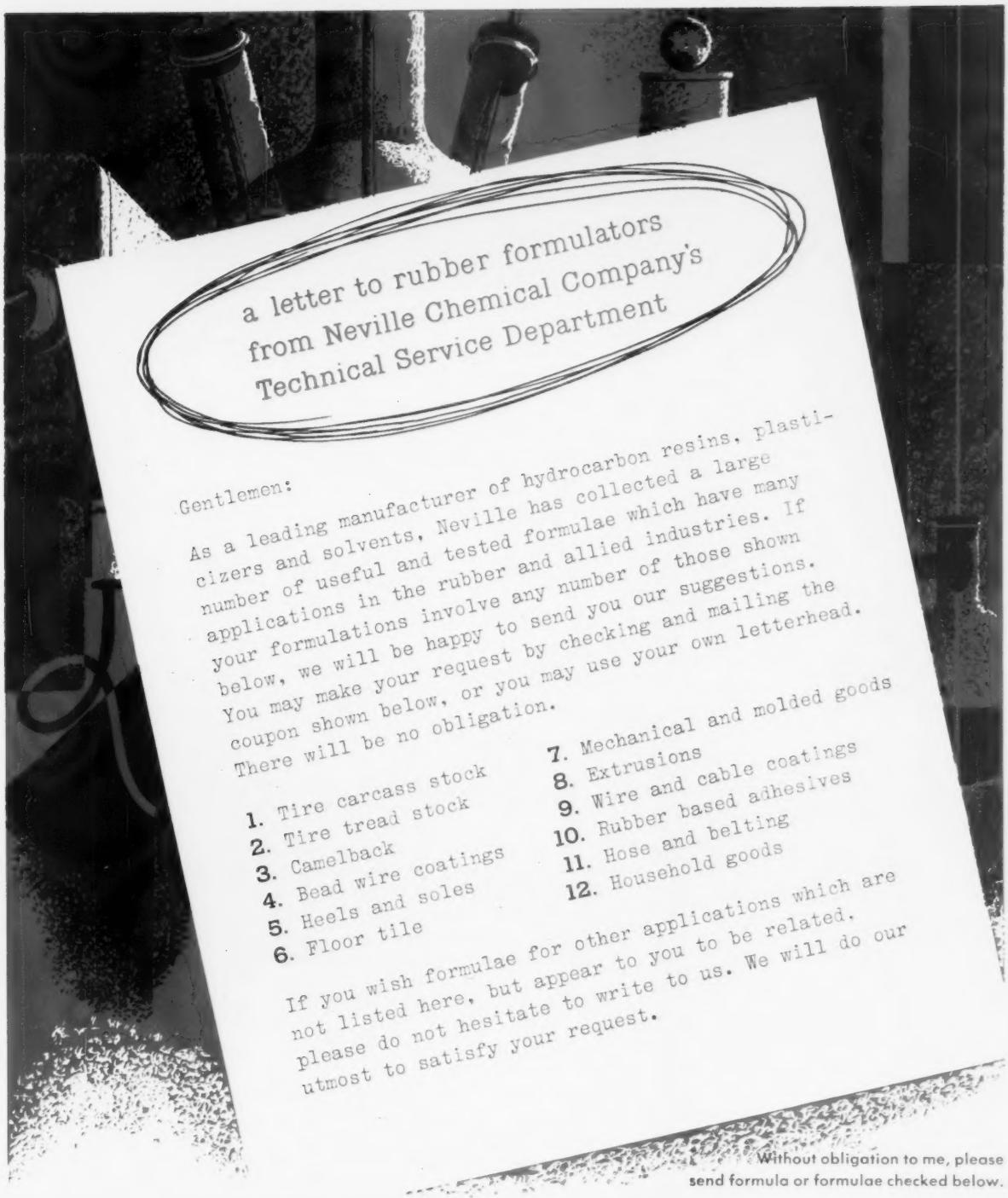
*TITANOX is a registered trademark for the full line of titanium pigments offered by Titanium Pigment Corporation.


a letter to rubber formulators
from Neville Chemical Company's
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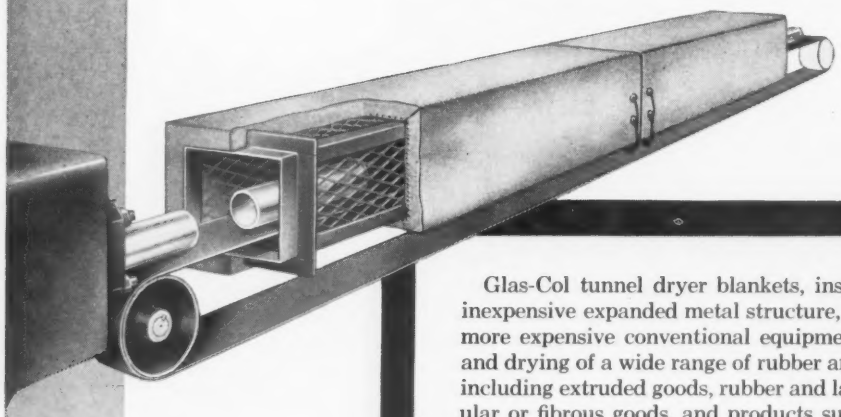

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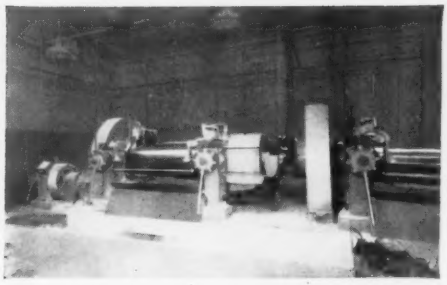

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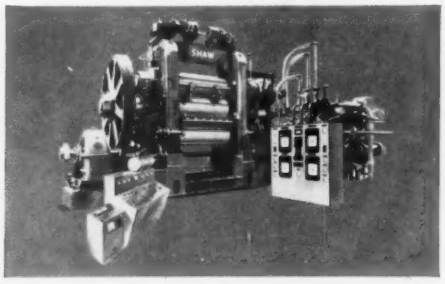

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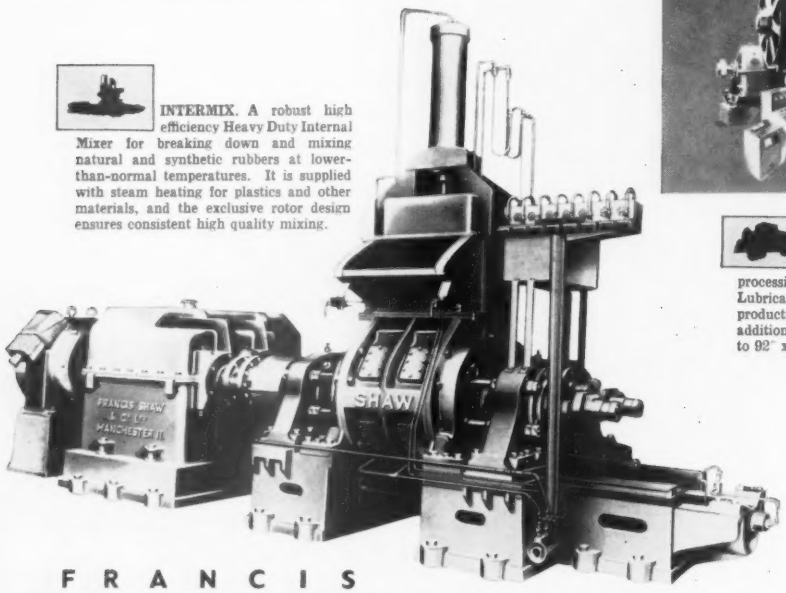

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Rubber Age

Vol. 83, No. 2 May, 1958

By W. L. DUNKEL and R. R. Phelan
Enjay Laboratories, Linden, N. J.

ACCELERATED OZONE AGING

(1) Resistance of vulcanizates

(2) Time saving in many sample studies

(3) Variables which affect butyl rubbers

THE majority of elastomers when exposed under strain to the atmosphere exhibit cracking to various degrees. This presents a serious problem from the standpoint of the service life of rubber parts. It has been shown that the prime cause of elastomer deterioration is atmospheric ozone (*1,2*).

Atmospheric ozone generally can be found at the earth's surface in concentrations of ten pphm or less. However, in certain critical areas, such as Los Angeles, many daily maximum values have been found in the 25 to 45 pphm range over the past years with values as high as 90 pphm occasionally reported *(3)*. In the New York-New Jersey area, the ozone concentration seldom rises to 10 pphm or above (*4*).

The need for an accelerated ozone laboratory test which can simulate and most accurately predict the weathering performance and service life of one rubber compound compared to another has long been sought. In most tests conducted in the industry, samples of vulcanizates are subjected to accelerated tests in which ozone concentrations of about 50 pphm are employed. It is expected that, except in very rare instances, these concentrations would not be encountered under actual conditions.

In these accelerated tests, factors such as stress, strain, temperature, and sample type, are usually more severe than those met within normal practice. Consequently, results obtained on different compounds in such a manner generally are of a comparative nature and can only be used to show trends. A correlation between the accelerated tests and outdoor weathering tests is sometimes futile and can be misleading. However, the fact remains that in many instances rubber compounders must choose a rubber compound based on these accelerated tests.

In order to obtain an accelerated ozone test which could predict, fairly accurately, the weathering performance of one polymer compared to another, we investigated an ozone concentration range of 25 pphm to 0.8 volume per cent. The study was further expanded to investigate various elastomers and the effects of temperature, stress and strain.

The opportunity of determining the compounding variables affecting the ozone resistance of butyl rubber vulcanizates was also afforded to us during the course of this investigation. Variables such as cure state, degree of unsaturation in the polymer, filler loading, plasticizer content, and contamination were found to have an important bearing on the weathering resistance of the vulcanizate.

Note: This paper was presented before the Division of Rubber Chemistry, A.C.S., New York, N. Y., September 12, 1957.

Experimental Procedure

Compounding of Vulcanizates. As will be illustrated in the second portion of this work, compounding ingredients show a marked effect on the ozone resistance of the resulting vulcanizate. To minimize variables resulting from compounding, recipes were employed which consisted of 50 phr of channel black and standard cure systems (Table I). The compounds were not specifically designed to give maximum ozone resistance nor was any added antioxidant employed in these studies. The compounds studied and physical properties of the vulcanizates are presented in Table I.

Testing Conditions. All tests were run on press cured ASTM specimens (*5*). The ends of the samples were firmly clamped in a metal rack which conveniently allowed the samples to be expanded. Each sample was marked with a 1-inch bench mark and then stretched to the desired extension. After stretching, the samples were allowed to relax for 30 minutes before being exposed.

In the interest of reliability of results, all tests were run on duplicate samples and the results averaged to give the reported value. The samples were arranged in the test chamber so as to minimize the error due to

TABLE I—FORMULAS AND PHYSICAL PROPERTIES OF VULCANIZATES USED IN OZONE AGING STUDY

	Enjay Butyl 035	Enjay Butyl 325	GR-S 1502	Smoked Sheet	Neoprene GRT
Polymer	100.0	100.0	100.0	100.00	100.00
EPC Black	50.0	50.0	50.0	50.00	50.00
Zinc Oxide	5.0	5.0	5.0	5.00	5.00
Reogen	—	—	—	1.00	2.00
Stearic Acid	3.0	3.0	2.0	1.00	0.50
TMTDS	1.0	1.0	—	0.10	—
MBTS	0.5	0.5	1.5	1.00	0.75
CDMCS	—	—	0.1	—	—
Sulfur	2.0	2.0	2.0	2.75	—
Calcium Magnesia	—	—	—	—	4.00
PHYSICAL PROPERTIES					
Cure Time/Temp	20 min. @ 307°F.	20 min. @ 307°F.	40 min. @ 280°F.	40 min. @ 280°F.	15 min. @ 307°F.
Tensile, psi	2440	2515	3575	3300	3120
Elongation, %	780	650	500	515	450
Modulus @ 300%	510	960	2250	1595	2345

concentration differentials in the chamber (this concentration differential is especially severe at high ozone levels).

Three ozone test chambers were used in this study. At the low concentrations, 25 to 200 pphm, a Mast Development Co. (*6*) or Bush Associates chamber was employed. Both of these are dependent on an ultraviolet lamp for the ozone source. For studies at high concentrations a Welsbach Ozonator was employed. This instrument generates ozone using a silent discharge system. Ozone generated in this unit was blown through a large bell jar which was used as the test chamber. In this way the samples could be continually observed without disturbing the system. This is necessary since relatively short crack times are obtained when using high ozone concentrations.

In ozone testing we must distinguish between cracking and breaking of a rubber compound. Long before a sample breaks, its useful life is completed. By the same token, once a rubber article cracks, its useful life is greatly reduced. Thus, the break time of rubber is of little use as a criterion of performance in service. A better yardstick is crack time. Therefore, the work done in this laboratory and many others toward predicting life of rubber articles is based on crack time.

It has previously been stated that the degree of cracking does not easily lend itself to measurement (*2*). This is true of outdoor exposure studies. However, higher ozone concentrations and more severe exposure conditions shorten the time interval which permits close observation until the first signs of cracking.

Discussion of Results

Effect of Ozone Concentration. One would presume, and rightly so, that the apparent ozone resistance of a vulcanizate will vary with ozone concentration. However, the extent of this variation has been difficult to predict. At ozone concentrations from 25 pphm to 200 pphm and a temperature of 100°F., the ozone resistance of Enjay Butyl and neoprene vulcanizates show a marked decrease with increasing concentration (Figure 1). This holds at extensions of 25 and 100 per cent. Styrene rubber and natural rubber show a comparatively small change in crack time (when compared to Enjay Butyl and neoprene) under these conditions. In this case, initial ozone attack is so rapid that the effect of concentration is not apparent.

The most unsaturated grade of Enjay Butyl tested (325) follows a similar pattern to that of neoprene. Finally, it can be seen that the apparent ozone resistance of Enjay Butyl 035 is superior to all vulcanizates tested.

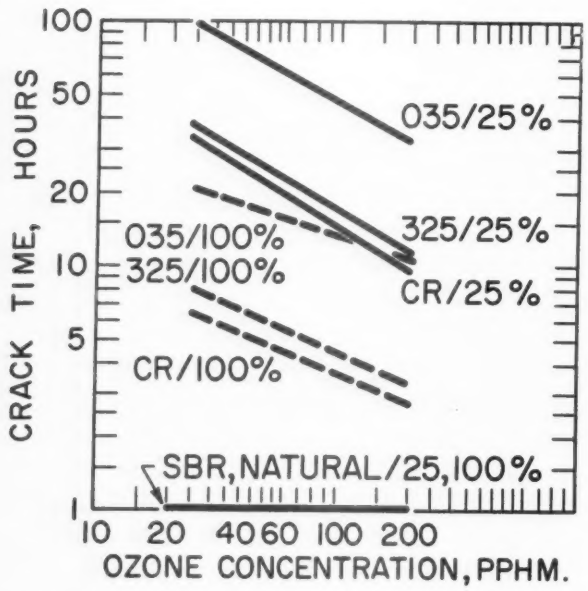

FIG. 1—Effect of ozone concentration at 100°F. (Note: CR is used to designate neoprene).

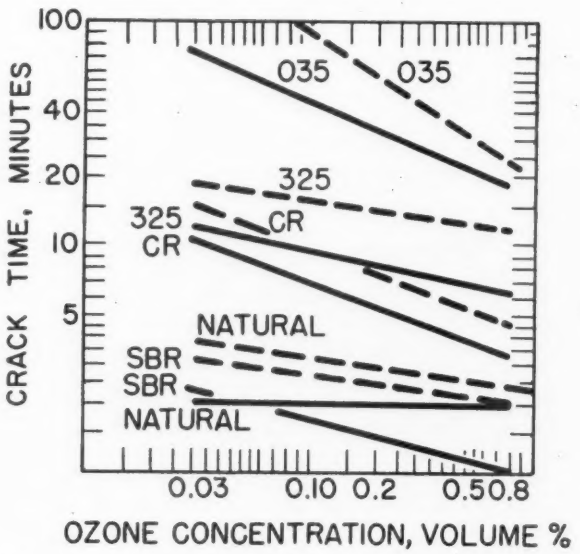

FIG. 2—Effect of ozone concentration at room temperature. (Note: Solid line = 100%, broken line = 50%).

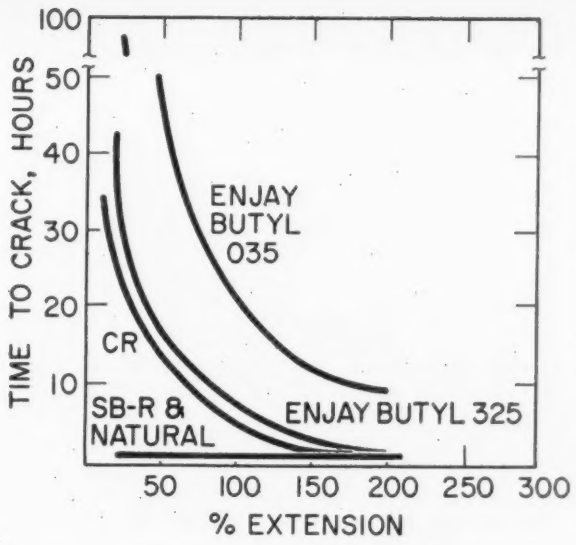

FIG. 3—Effect of extension—100°F., 25 pphm ozone.

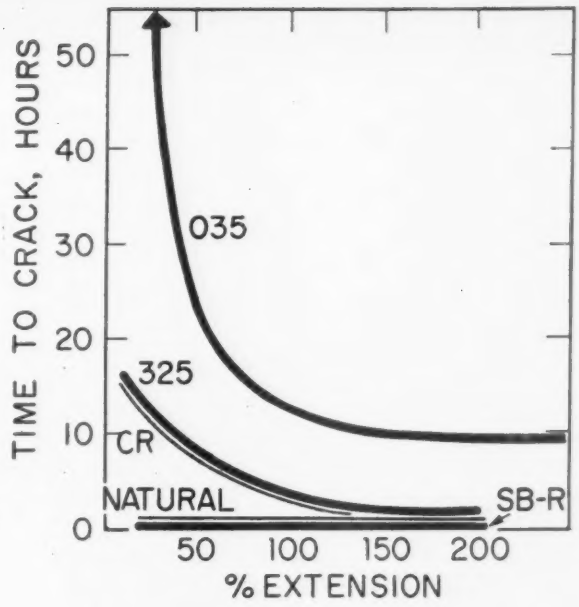

FIG. 4—Effect of extension—100°F., 100 pphm ozone.

This is probably due in large measure to the low degree of unsaturation in the polymer and will be discussed more fully in a later section.

In Figure 2 similar vulcanizates were tested in atmospheres containing 0.03 to 0.8 volume per cent ozone. These tests were conducted at room temperature and the samples were elongated 50 and 100%. At the lower limit of this range there is a wide and clear-cut differentiation between the ozone resistance of these elastomers. However, as the O_3 concentration increases this differential becomes smaller. As at the lower concentration, Enjay Butyl and neoprene show a greater change in ozone resistance with increasing concentration than does natural or styrene rubber. Once again the lowest unsaturated polymer employed in these tests, Enjay Butyl 035, showed the greatest response to the increase in ozone concentration.

In the range of 0.03 to approximately 0.2 volume per cent O_3 concentration there appears to be a sufficiently large spread in the data to use this region for studying ozone resistance. Above this concentration the curves tend to converge and ozone degradation takes place very rapidly. Below this region the test becomes time consuming.

Effect of Extension. It is well known that a vulcanizate under no strain and at a temperature below 150°F. will show no visible damage due to ozone attack *(7, 8)*. However, most rubber parts in service are usually subjected to forced strain. Under this condition ozone attack is enhanced.

We have found that as ozone concentration is increased, the effect of extension on crack time becomes less of a dependent variable. In Figure 3 it can be seen that at an ozone concentration of 25 pphm, extension plays an important part on the resistance of samples of butyl rubber and neoprene to cracking. Styrene rubber and natural rubber, even at this low ozone concentration, are not too dependent upon extension. As ozone concentration is increased to 100 pphm, the extension still is an important factor (Figure 4).

In the region of higher ozone concentrations, 0.03 volume per cent, the vulcanizates of butyl rubber and neoprene appear to be more affected by extension than styrene rubber or natural rubber (Figure 5). Even at this concentration, as extension increases again ozone resistance rapidly decreases. At an ozone concentration of 0.5 volume per cent, crack resistance of all polymers studied is essentially independent of extension (Figure 6). Here the difference in crack time between the two extremes is at the most only a few minutes. If we assume that stress relaxation has a bearing on the ozone resistance of the strained vulcanizate this conclusion appears valid, since under high strain and high ozone concentration the samples apparently do not have sufficient time to relax.

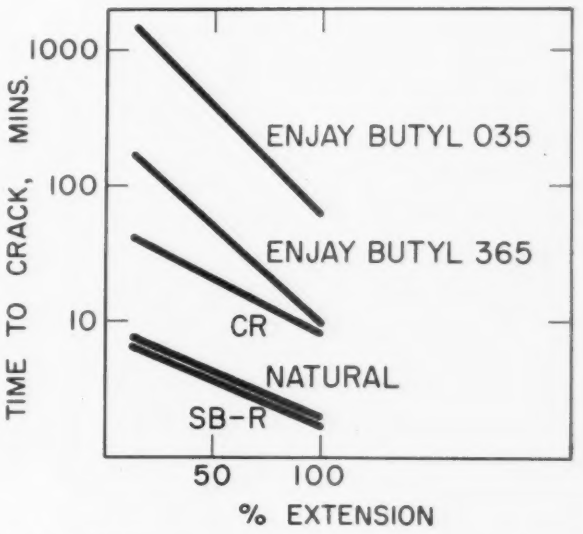

FIG. 5—Effect of extension—room temperature, 0.03 volume % ozone.

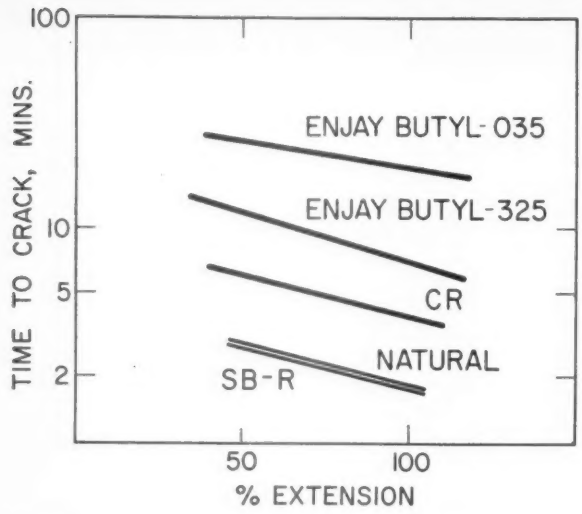

FIG. 6—Effect of extension—room temperature, 0.5 volume % ozone.

Effect of Temperature. Another variable which affects the ozone resistance of rubber compounds is temperature. Whether ozone attack takes place at double bonds, the polymer-pigment linkage or the α-hydrogen, it is still presumed to be a chemical reaction. As such, it would be expected that any increase or decrease in temperature would result in a corresponding change in the reaction rate.

In Figure 7 is shown the effect which temperature has on ozone resistance. As the temperature is increased ozone resistance decreased. At about 130°F. a difference in crack time still existed but was not as pronounced as at the lower temperatures.

In Table II is shown the effect of low temperature and high ozone concentration on crack time. Both Enjay Butyl and neoprene showed no effects after seven hours at these conditions. Natural rubber and styrene rubber exhibited an increase in ozone resistance over that at room temperature by a factor of 30 to 80.

Effect of Nitrous Oxide and Organic Vapors. The thought has been advanced that oxides of nitrogen present in the atmosphere may also cause rubber samples to crack in a similar manner to that caused by ozone. In many instances organic vapors are also present in the air and these may further aid in deterioration of vulcanizates.

TABLE II—EFFECT OF LOW TEMPERATURE AND HIGH OZONE CONCENTRATION ON CRACK TIME

(1.4 Volume Per Cent Ozone)

	Temp. (77°F.) Mins. To Crack		Temp. (—48°F.) Mins. To Crack	
Elongation	50%	100%	50%	100%
Natural Rubber	3	1	90	40
Styrene Rubber	3	1	210	80
Neoprene	5	5	No cracks after 420 minutes	
Enjay Butyl 325	9	6		
Enjay Butyl 035	23	11		

TABLE III—SUMMARY OF TEST CHAMBER DATA WITH OUTDOOR WEATHERING STUDIES

	Enjay Butyl Rubber Sample		
	A	B	C
0.2 vol. % O_3—Time to Crack, Mins.	105	90	60
50 pphm O_3—Time to Crack, Hours	195	123	70
Florida—Time to Crack, Months	5	4	2
California—Time to Crack, Weeks	7	7	3

A series of vulcanizates extended 50% was exposed to pure nitrous oxide. This gas was continually passed over the samples at a rate of about 1.2 liters per hour at room temperature for a seven hour period. No visible effects were noted after this time. Organic vapors (hexane and benzene) were introduced into the chamber containing the vulcanizates and the test repeated. Again the rubber samples remained unchanged. From our preliminary data, nitrous oxide and organic vapors appear to show no effects on strained vulcanizates.

Correlation of Outdoor Aging Data with Ozone Chamber Data. Correlation of outdoor weathering results in different parts of the country with ozone cabinet data has been the attempt of many workers in the rubber field *(9)*. Many of these attempts have been only moderately successful. This is to be expected since atmospheric conditions such as temperature, sunlight, humidity and oxidants other than ozone vary widely in different parts of the country. To further complicate the picture, the ozone chamber maintains constant conditions throughout the testing period. Thus, one can only expect to correlate trends between outdoor data and ozone chamber data.

A series of tests based on Enjay Butyl compounds was recently completed in which the samples were exposed in various locations in the United States as well as to 50 pphm and 0.2 volume per cent ozone in a test

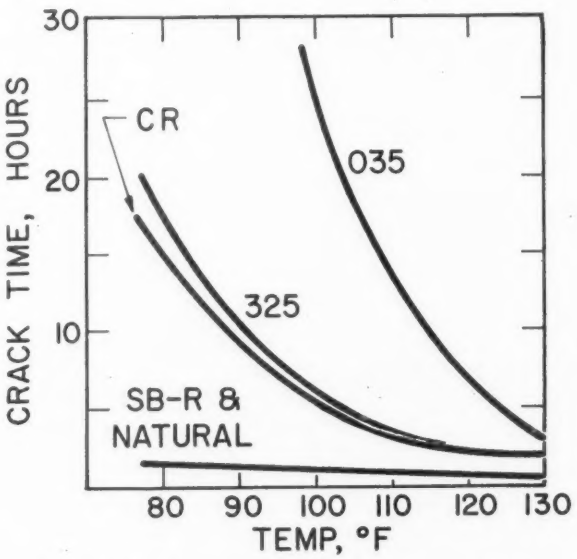

FIG. 7—Effect of temperature—50% extension, 100 pphm O_3.

TABLE IV—COMPARISON OF OZONE CHAMBER DATA WITH OUTDOOR WEATHERING DATA AT LINDEN, N. J.

	Outdoor Weathering Data												Ozone Chamber Data			
	March			April			May			August (6 Months)			Mins. Crack 0.5 vol. %, 77°F.		Hrs. Crack 25 pphm, 100°F.	
Extension, %	25	50	100	25	50	100	25	50	100	25	50	100	50	100	50	100
7001-0	0	0	0	0	0	0	0	0	0	1	2	2	26	19	44½	21
7001-1	0	0	0	0	0	0	0	0	0	1	2	2	20	16	30	17½
7001-2	0	0	0	0	0	0	0	0	0	2	2	3	17	13	17½	12½
7001-3	0	0	0	0	0	0	0	1	1	2	2	Broken	12	7	12	7½
7001-4	0	0	0	0	0	0	0	0	0	2	2	2	17	9	16½	10
7001-5	0	0	0	0	0	0	0	0	0	2	2	2	17	11	18	13
7001-6	0	0	0	0	0	0	0	0	0	2	2	2	18	11	18	12½
7026-0	0	0	0	2	2	2	2	2	2	3	3	Broken	3	2	1	1
7026-1	0	0	0	2	2	2	2	2	2	3	3	Broken	3	2	1	1
7026-2	0	0	0	0	0	0	0	1	1	1	2	2	6	4	13	6½

Note: For numerical rating system used to indicate cracking see Literature Reference 10.

chamber. These results are summarized in Table III. Additional data have been compiled at our laboratories to substantiate these facts.

The samples described in Table I were also subjected, under various elongations, to outdoor weathering at Linden, New Jersey. Combined results of the outdoor study, 50 pphm and 0.5 volume per cent data are presented in Table IV. Thus, test results obtained in an atmosphere containing 0.2 volume per cent ozone exhibit the same relative difference in ozone resistance as that obtained using 50 pphm ozone. Furthermore, trends in outdoor weathering effects can be determined using either of the two ozone concentrations mentioned above.

Compounding Variables Affecting Ozone Resistance. During the course of our investigation on ozone test procedures, we also studied the compounding variables which appeared to affect the ozone resistance of Enjay Butyl vulcanizates. Cure state is by far the most important factor in obtaining the maximum in ozone resistance from butyl rubber. This is illustrated in Figure 8. Here ozone resistance is plotted, as the minutes to crack a ¼ x 0.075 inch specimen, against cure time.

For any grade of polymer, maximum ozone resistance is obtained at approximately the highest state of cure. Cure state was determined by volume swell measurements and 100% modulus. As can be seen, a drastic decrease in ozone resistance is obtained with either undercure or overcure. Surface reversion due to overcure appears to have a pronounced effect on the ozone resistance.

This figure also points out the effect which polymer unsaturation plays on ozone resistance. The lowest unsaturation—found in Enjay Butyl 035, depicted by the top curve—shows a much higher resistance to ozone attack at optimum cure than do the other polymers. However, somewhat longer times are required to reach optimum cure when using this grade of butyl rubber. Good ozone resistance can be attained with Enjay Butyl 165 if the cure time is a dominating factor.

Figure 9 illustrates the effect of carbon black loading and type on the ozone resistance of Enjay Butyl compounds. The more highly reinforcing blacks tend to yield vulcanizates possessing poorer ozone resistance, at constant elongation, than do the less reinforcing blacks. The effect which EPC black has on ozone resistance is comparable to the effect it shows in aged vulcanizates. Higher loadings of carbon black in butyl rubber stocks decrease the ozone resistance. This is attributable to the higher degree of reinforcement. Non-black fillers, as a whole, when used in butyl rubber compounds, do not give as much reinforcement as the blacks. Consequently, compounds containing non-black fillers exhibit better ozone resistance than do comparable stocks containing carbon black. Plasticizing oils impart a similar condition into a butyl rubber compound (Figure 10).

The ozone resistance of butyl rubber stocks is markedly decreased by the presence of only very small amounts of styrene rubber. Contamination with styrene rubber cannot be detected by physical properties at less than one part level. However, at 2.5 phr the modulus falls off and hardness increases. As shown in Figure 11, ozone resistance is decreased nearly 50% at the 0.5 phr level. This decrease continues as the styrene rubber concentration increases.

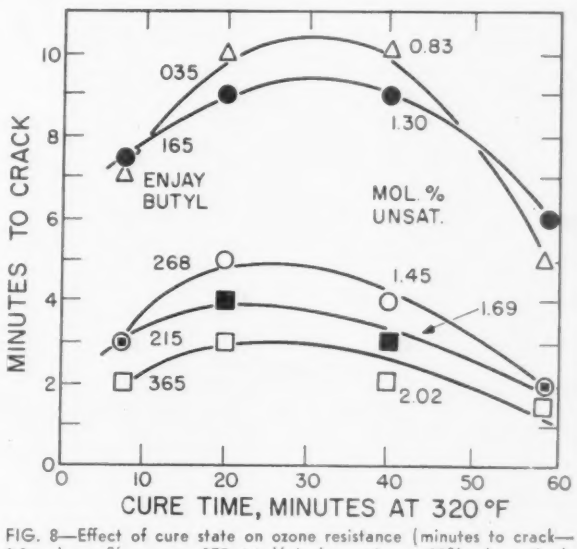

FIG. 8—Effect of cure state on ozone resistance (minutes to crack—0.2 volume % ozone, .075 × ¼-inch specimen, 50% elongation).

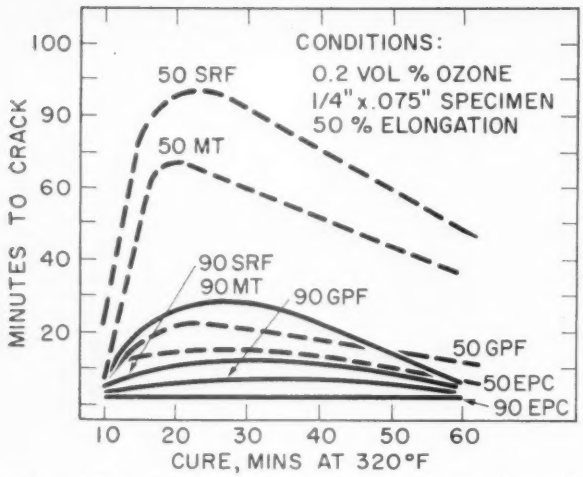

FIG. 9—Effect of fillers on ozone resistance of butyl rubber vulcanizates.

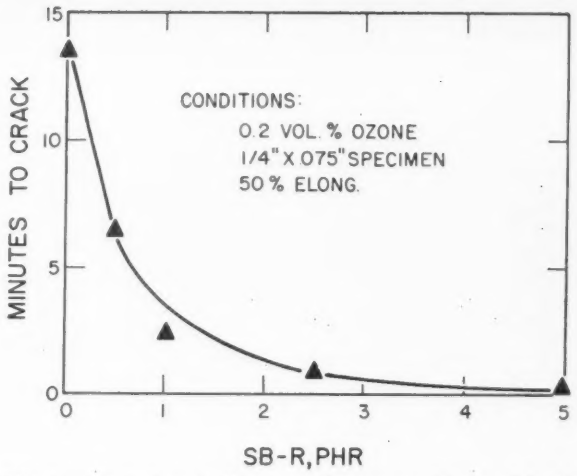

FIG. 11—Effect of contamination on the ozone resistance of butyl rubber vulcanizates.

Cure systems, sulfur, and sulfur level also exert an influence on ozone resistance. The highest amount of sulfur which can be tolerated should be employed, and the use of an easily dispersable sulfur, such as spider sulfur, is highly recommended. Cure systems employing TMTDS and MBT appear to offer as good a combination as any.

Conclusions

The ozone resistance of a number of rubber vulcanizates have been studied over a wide range of ozone concentrations under various conditions of temperature and extension. The data show that the test may be accelerated by raising the ozone concentration as high as 0.2 volume per cent without changing the relative position of the elastomer types. It has also been shown that a reasonable correlation exists between this test (0.2 volume per cent ozone, 50% extension at 77°F.), the standard ASTM (D-1149-557) 50 pphm ozone test, and outdoor aging studies in Florida, New Jersey and California.

This type of accelerated ozone testing is extremely valuable when conducting compounding studies involving a multitude of samples. The testing time is cut down from days to minutes by the proper selection of conditions.

Variables which affect the ozone resistance of butyl rubber vulcanizates have been investigated. State of cure, polymer unsaturation, filler and plasticizer loading, along with contamination by styrene rubber all affect the ozone resistance. In general, accelerator systems for a sulfur cure have little effect. Sulfur level is also found to contribute to the ozone resistance of the vulcanizate.

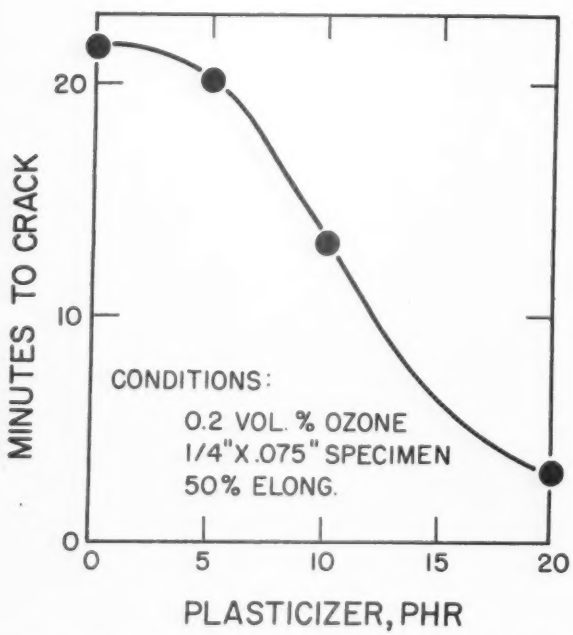

FIG. 10—Effect of plasticizer on ozone resistance of butyl rubber.

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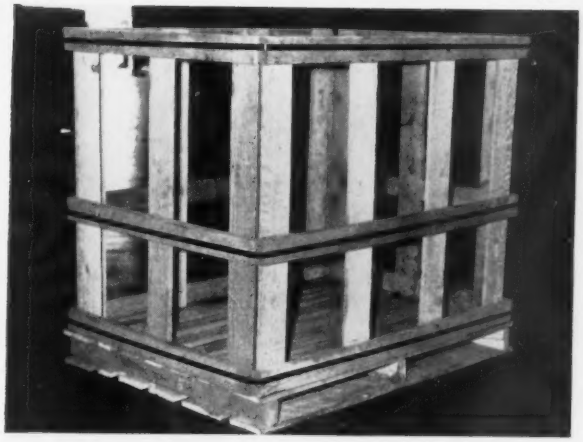

FIG. 1—Three steel straps tie the Flotainer walls into a rigid fence, which is put on a regular 4 x 5 foot pallet and lined with cardboard.

A new container for

Packaging Handling Storing

Styrene Rubber

AMONG its manufacturers and consumers it is common knowledge that non-pigmented styrene rubber is a source of packaging and handling problems. They are familiar with the consequences of cold flow of bales, filmwrap rupture, rubber extrusion from torn bags or boxes, and, above all, rubber adhesion and contamination. An extensive study of these problems, carried on by the Shell Chemical Corporation for the past two years, has resulted in the development of a successful new type of package, the Flotainer.

The Flotainer package consists of five elements: a 4 x 5-foot wooden pallet base and four wooden framework walls. The walls each contain three horizontal members (2 x 4 inches) for bending strength. These four walls are tied together into a rigid fence by three ¾-inch steel straps, bearing on the outside surface of the horizontal members. This fence is then placed on top of the pallet (Figure 1) and the resulting rigid bin structure is lined with cardboard sheets. Forty-two filmwrapped bales are stacked inside in seven tiers of six bales each. The weight of this load locks the walls in place on the pallet. In case of long distance or marine shipping, it is sometimes desirable to use additional vertical steel strapping to tie the walls and pallet together (Figure 2).

Although the Flotainer is still in the early stage of commercial application, its important advantages have already been conclusively demonstrated. The light but strong walls hold the pressure of the settling bales and allow the rubber to set into neat stacks of convenient size with no film rupture and no inter-bale or bale-to-package adhesion.

FIG. 2—An advantage obtained by the Flotainer in shipping is full utilization of boxcar capacity.

FIG. 3—The strength of the walls used in the Flotainer permits three high stacking and thus provides best use of warehouse storage space.

FIG. 4 — Transporting the styrene rubber containers via truck. Here 47,500 pounds of the synthetic elastomer are packed in one shipment of fifteen Flotianer units.

The strength of the Flotainer walls amply permits three high stacking. Figure 3 shows that this can be accomplished with a standard 4000 pound capacity fork lift truck. In the 8 x 15-foot warehouse corner shown in the photograph a total of 56,000 pounds of rubber can be stored when the units are stacked three high.

The Flotainer is well adapted to most methods of shipping. The units can be stacked two high inside any railroad car (Figure 2). A 40-foot boxcar can hold 28 Flotainers (88,000 pounds of rubber) and a 50-foot car can accommodate 36 units (113,000 pounds of rubber). In order to prevent load shifting in transport the Flotainer can be steel strapped against the boxcar walls.

Figure 4 shows that this container is well adapted for shipping on flatbed trucks. The truckload, photographed leaving Shell Chemical's Synthetic Rubber Plant at Torrance, California, carries 15 Flotainers containing 47,500 pounds of rubber.

The Flotainer package is further designed for maximum customer convenience in opening and package disposal. The Flotainer walls can be removed in a matter of seconds by cutting the three horizontal steelstraps (Figure 5). A specially designed wall interlock construction permits easy insertion of the cutting tool. After removal of the walls and cardboard liners, the stack of bales, still resting on the pallet, is ready for immediate processing or for further handling (Figure 6).

When interlock stacked, the four Flotainer walls take up only 10% of the volume and 4% of the weight of the loaded container. The walls and pallets can be readily handled and shipped back to the synthetic rubber manufacturer.

The advantages of the Flotainer are as follows:

(1) Rubber flow in storage and handling is virtually eliminated. Film rupture and inter-bale or bale-to-package adhesion, therefore, have ceased to be a packaging problem. Because of its strength, the Flotainer also provides improved protection against damage and contamination of its contents.

(2) The laborious unwrapping, handling and restacking of each bale at the rubber consumer's plant is eliminated. Instead, only the three steelstraps that hold the walls have to be cut. Then the four walls and liners can be removed in a matter of seconds and the stack of bales, which is still resting on the pallet, is ready for processing.

(3) The strength of the Flotainer walls results in good stability of three unit high stacks. The hazards of toppling palletloads of boxed or bagged bales are eliminated.

(4) Three-high stacking of the Flotainer package can be performed with standard 4000-pound capacity fork lift trucks. This results in greatly increased warehouse space utilization.

(5) The Flotainer is well adapted to most methods of shipping and generally permits greater utilization of the available load carrying capacity.

(6) Disposal of the cardboard liners is much easier than that of a like number of empty bags or boxes.

FIG. 5—Dismantling is accomplished in a few seconds simply by cutting the three steel straps and removing the walls and liners.

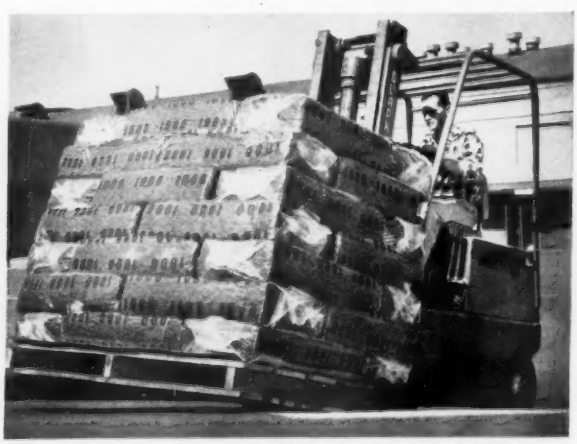

FIG. 6—After removal from the Flotainer, the neatly stacked, adhesion-free bales, here totaling 3150 pounds, are ready for processing.

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High Speed Photography in the Rubber Industry

Apparatus Techniques Applications

A practical approach useful in manufacturing and testing high polymeric materials

RUBBER has attained its unique position in the field of engineering materials because of its extreme deformability and its ability to return quickly almost all of the energy of deformation. The theory of the molecular structure responsible for this high elasticity has been developed only in relatively recent years. Important among the physical test methods used to verify this theory has been the use of high speed photography.

Both Mrowca, Dart and Guth *(1, 2)* and Stambaugh, Rohner and Gehman *(3)* used Strobolux photography supplemented by the Edgerton method for measuring the speed of retraction of stretched strips of rubber based on various polymers. It was shown in the latter reference how the velocity of retraction was dependent upon density, modulus, internal friction, plastic flow and the stress relaxation of the material before it was released.

Outside of these fundamental studies on rubber retraction, little has been published on the use of high speed photography in the rubber industry and on rubber products. A practical example of such use, however, is given by White *(4)* in which the high speed camera was used to determine automobile speeds, driver reaction time and stopping distances in a study of different tires.

High speed photography has been used extensively in other fields. References to these uses are included in a recent bibliography *(5)*. The purpose of the present work is to describe some of the techniques and applications of several types of high speed photography, especially the high speed camera, which have been found to be useful in different phases of the manufacture and testing of high polymeric materials.

Apparatus

As in most fields of photography, the list of possible equipment is almost endless. However, the following items have been found adequate for most of the studies attempted:

FOR TAKING PICTURES

(1) Kodak high speed camera with 152 mm f-4, 63 mm f-2 and 25 mm f-1.9 lenses and heavy-duty supporting stand.

(2) Good still camera with ground glass focusing.

(3) Light meters for use with still camera.

(4) Strobotac, Strobolux and short duration strobe lights for use with still camera.

(5) Self-locking relay, operated by camera, to turn on lights when film is part way through camera.

(6) Five holders for reflector-spot (RSP-2) lights, two 500 watt keg lights, two airplane landing lights with autotransformer set for 28 volts.

(7) A two-circuit electric cable 50 feet long capable of carrying 30 amperes per circuit; identifying numerals to be placed in the photographic field; and a 50 foot steel tape for measuring distance from camera to subject.

FOR PROCESSING AND EDITING PICTURES

(1) A small hand-operated developing tank (the Morse G-3 is satisfactory).

(2) A drying reel capable of holding 100 feet of film (Figure 1).

(3) A film editor and splicer (the Corona Super Editor or the Cine-Kodak Junior Splicer are satisfactory).

FOR VIEWING AND STUDY OF PICTURES

(1) A time study projector which can be stopped for viewing of individual frames (Bell and Howell Model 173-AD is satisfactory), and screen.

(2) A microfilm reader (optional).

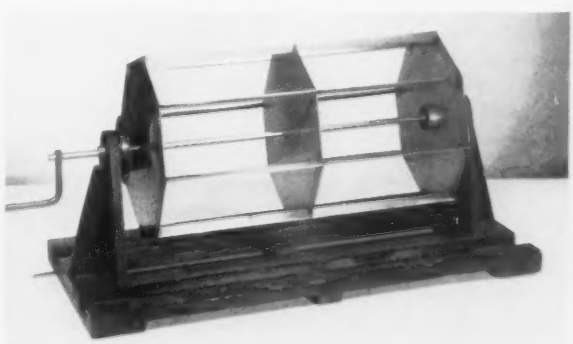

FIG. 1—A drying reel capable of holding 100 feet of film is a necessary piece of processing equipment.

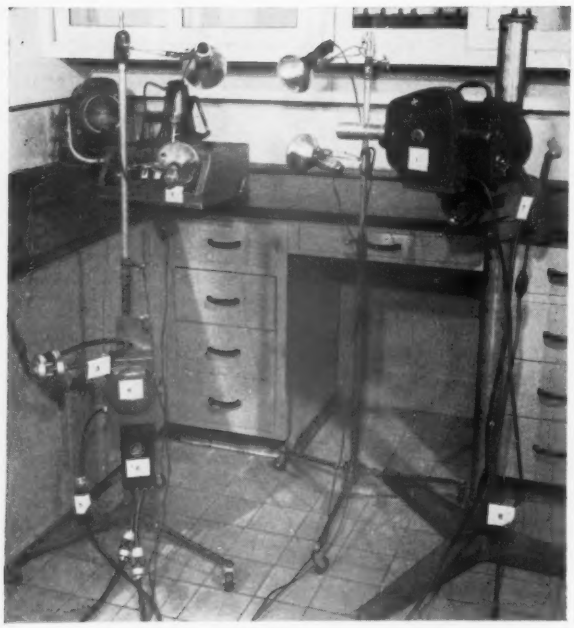

FIG. 2—A typical set-up for the high speed camera. The camera is marked 1, and the subject, an apparatus for determining brittle point temperature of elastomers, 2. The other numbered items are identified in the text.

Materials and Methods

Since most rubber products are black, and the frame exposure time in the high speed camera is extremely short, an ever present problem is one of obtaining sufficient exposure. The following considerations have been found to be important in this connection:

(1) Use a high speed film. A Tri-X negative film is the most satisfactory of those tried. Besides its greater speed, the negative film has the advantage of being easier to process than a reversal film. Since the negative film is somewhat thicker than positive prints, it is important to remember that the two cannot be spliced together and maintain focus on projection. Thus, titles spliced to high speed film must also be on film of the same thickness to achieve proper focus.

(2) Use high light concentration on the subject. On black bodies, four or five RSP-2 lights (not more than four feet away) with spots distributed evenly over the field plus two keg lights or two airplane landing lights from the rear of the subject to make it stand out from the background are usually sufficient. When the subject location is such that direct rear lighting is impractical it has been found satisfactory to illuminate a light colored background which has been placed directly behind the subject.

(3) Operate lights from a circuit with a full 120 volt potential and at least 30 ampere capacity. Light intensity is diminished very rapidly by voltage drops.

(4) Operate the camera as slowly as the action will permit.

The amount of light necessary to expose rubber products correctly is normally sufficient to overexpose the auxiliary material in the field unless it is also dark colored. Uniform lighting of the subject is sometimes difficult to achieve with spot lights. Unwanted concentrations, or dark spots, can sometimes be located better by sighting through the camera view finder than by looking directly at the over-all scene. Correct lighting is usually achieved by experience rather than by use of an ordinary light meter which is scaled to low light intensity.

A tyical set-up for the high speed camera is shown in Figure 2. The camera is identified by the numeral 1. The subject, in this case an apparatus for determining brittle point temperature of elastomers, is labeled 2. At 3 is shown the lighting voltage supply leading into the switch box, 4. A relay circuit—shown at 4, 5, and 6—turns on the lights while the film is passing through the camera. It can be activated after any desired number of feet of film have passed through the camera. The wiring of this relay, a diagram of which is shown in Figure 3, permits it to be activated initially by the built-in camera switch (at the terminal of cord 7 in Figure 2), after which it is maintained in a closed state until manually released by switch 4. The camera power cord, 8, which by-passes the relay, is supplied by a separate 30 ampere 120 volt power source.

A rather novel standard procedure has been adopted in which the relay is activiated after 45 feet of film has passed through the camera. The lights will have attained essentially full brightness by the time 55 feet of film have passed, thus exposing only the second half of a 100 foot roll of film. The film may then be shifted to the top spool and run through the camera again by the same procedure. Thus, two scenes may be photographed on the same film roll, both being captured at full camera speed.

Except in a very brightly lighted room it is not necessary to cover the lens during the first half of each run

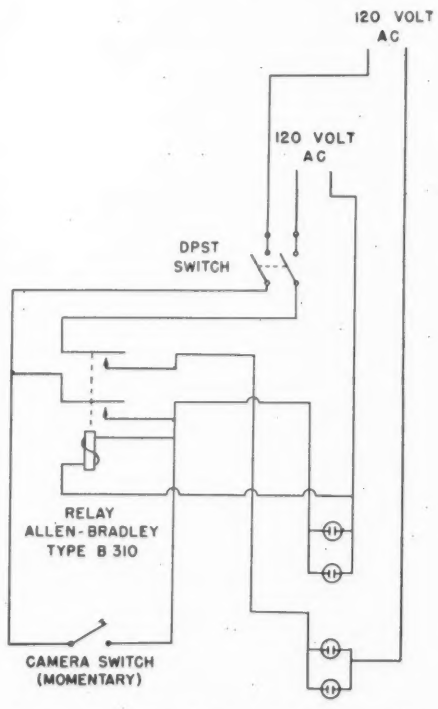

FIG. 3—Schematic diagram of the relay which turns on the lights while the film is passing through the camera.

since normal room lighting will not fog the film. The only adaptation necessary besides the relay circuit described above is an extra film reel in which the round center hole has been filed square so that the film roll may be reversed when it is placed in the camera for the second scene.

In photographing non-periodic events it is often necessary to have a signal indicating that the camera has reached full speed before the subject action is activated. The lights, controlled as above, have been found to be a better signal than the voice of the camera operator since the reaction time of only one individual is involved.

In many locations there is insufficient room for use of the camera stand shown in Figure 2. In this case it is usually necessary to bolt, or otherwise secure, the camera to some rigid support. Otherwise the vibrations produced by the camera motor will be sufficient to cause apparent periodic movements of the entire field when the scene is projected.

Techniques in Unusual Situations

On several occasions high speed movies of tires running at high speeds on indoor test machines were desired. Since this involved the possibility of tire failure and consequent danger to the operator, a remote control method was used. The camera switch was taped shut and a similar line switch in a safe location used to control the camera and lights.

No ac power lines were readily available for photographing the tire action on a racing car on the Indianapolis race track. A satisfactory power source was found in a portable dc generator of 120 volt, 20 ampere capacity. In this connection it was also found that bright sunlight alone provided sufficient light when Tri-X film was used. Experiments made in preparation for these pictures also showed the practicality of using a photocell to trip the camera when the subject racing car had reached the correct distance from the camera.

High speed photographs of tire action are subject to a "stroboscopic" effect which may make the tire appear to stand still or to rotate slowly either forward or backward. This happens when the peripheral motion of the tire between frames is nearly equal to the distance between design elements on the shoulder or tread. The situation is analogous to that in many Western movies in which the stagecoach wheels apparently reverse directions during a fast getaway.

The effect is particularly annoying in tread views of tires having design element lengths arranged to minimize noise continuity. The two halves of the tread appear to travel at different speeds, first one side and then the other appearing to move faster. A partial compensation for this effect can be made by marking lines on the tire at 4 or 5 inch intervals. These lines always appear in the projected pictuers to travel in the correct direction at a constant speed, thus orienting the viewer to the proper motion.

Two principal advantages may be cited for processing of film by the camera operators or associates rather than by commercial processors. First, results can be viewed in a relatively short time, thus permitting quick retakes should they prove necessary, and secondly, development can be varied to compensate for known exposure irregularities or for special contrast effects. For most film D-19 developer has been found to be quite satisfactory. In a few cases, however, it has been necessary to make close measurements on the projected pictures, thus making a finer grain developer such as D-11 more desirable. For general use, however, the fine grain developers do not produce sufficient contrast, and require excessive development time.

FIG. 4—Traction wave of a tire moving at 120 mph as photographed by a still camera using electronic flash lamps.

In some cases in which it was expedient to develop films rapidly a technique described by Jones *(6)* was found to be satisfactory. In this method the film was pulled from the reel in total darkness and draped into a bucket of developer, after which agitation was maintained by hand manipulation for the necessary time. The unrolled film was then transferred in turn into buckets of water, acid fixer and wash water. This procedure resulted in some emulsion abrasion and gave some difficulty in untangling.

Freshly processed film sometimes does not run smoothly in a projector. This difficulty is minimized, however, if the film is run through a projector soon after drying, and is not left on the drying reel long enough for creases to develop. In some cases a film waxer similar to that described in a motion picture engineering journal *(7)* can be used to advantage.

Water spots on the film can be minimized by using distilled water plus a wetting agent for the final rinse before drying and by wiping the film with a chamois or sponge as it is unrolled onto the drying reel. If any water spots or other dirt remain on the dried film, they can usually be removed by washing briefly in a cleaner composed of 50% carbon tetrachloride and 50% chloroform.

Ready access to any film in the file may be obtained by giving each reel a number. A data sheet for each reel number includes not only a description of the subject

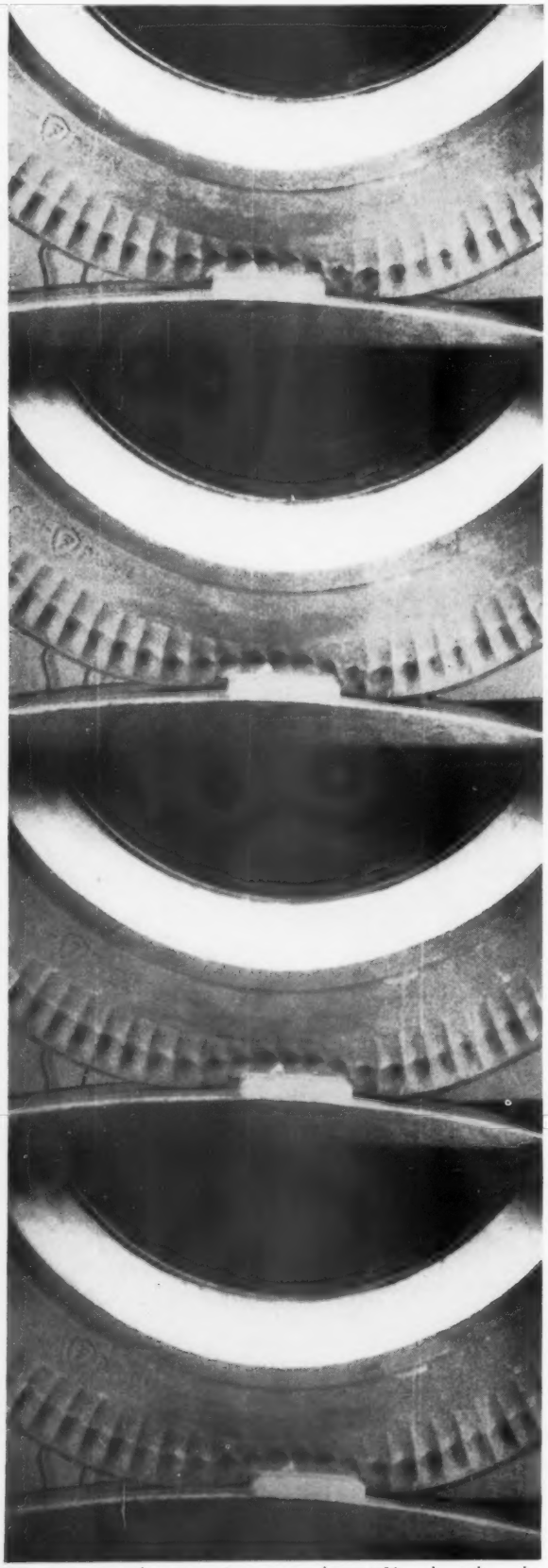

FIG. 5—Action of a tire going over a cleat at 30 mph as shown by the high speed camera.

and conclusions drawn, but also a summary of the lighting, film type, speed, subject distance, and other relevant information. A data sheet, adapted from one suggested by the Eastman Kodak Company in their manual of instructions for the high speed camera, has been very satisfactory. When several reels of film are taken of a single subject with only minor experimental modifications confusion of identity can be avoided by including the film number in the picture field.

The life of a film can be extended by storage in a constant humidity room (about 50% relative humidity).

Applications

Observation of Tires at High Speed. At speeds of about 100 miles per hour or higher ordinary passenger car tires develop a "traction wave" which is initiated at the throwout region of the footprint. To the unaided eye it appears to be a standing wave, but in reality each portion of the tread is deformed by an amount equal to the observed amplitude. There are no true nodes. The wave, which may persist around half or more of the tire perimeter, is responsible for high energy absorption and appears to contribute to tread chunk-out, tread cracking or even separation of the entire tread from the tire.

Observation of this phenomenon by stroboscopic light showed the nature of the wave, indicating bilateral stretching at the crests and bilateral compression at the troughs. It was also possible through slight variations in flash frequency to observe incipient failures or "bubbles" in the tread. This method of lighting, however, did not lend itself readily to obtaining photographic records. Quite clear pictures of the wave were obtained with a still camera using electronic flash lamps. An example is shown in Figure 4. Although these pictures in general were clearer than high speed camera photographs, they did not offer the opportunity to study the action of a particular spot on the tread as it passed through the wave. High speed photographs showed this action nicely.

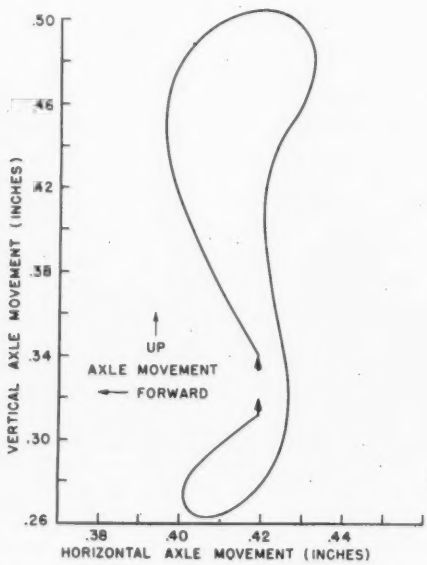

FIG. 6—Relative size and sequence of true axle motion vertically as well as fore and aft.

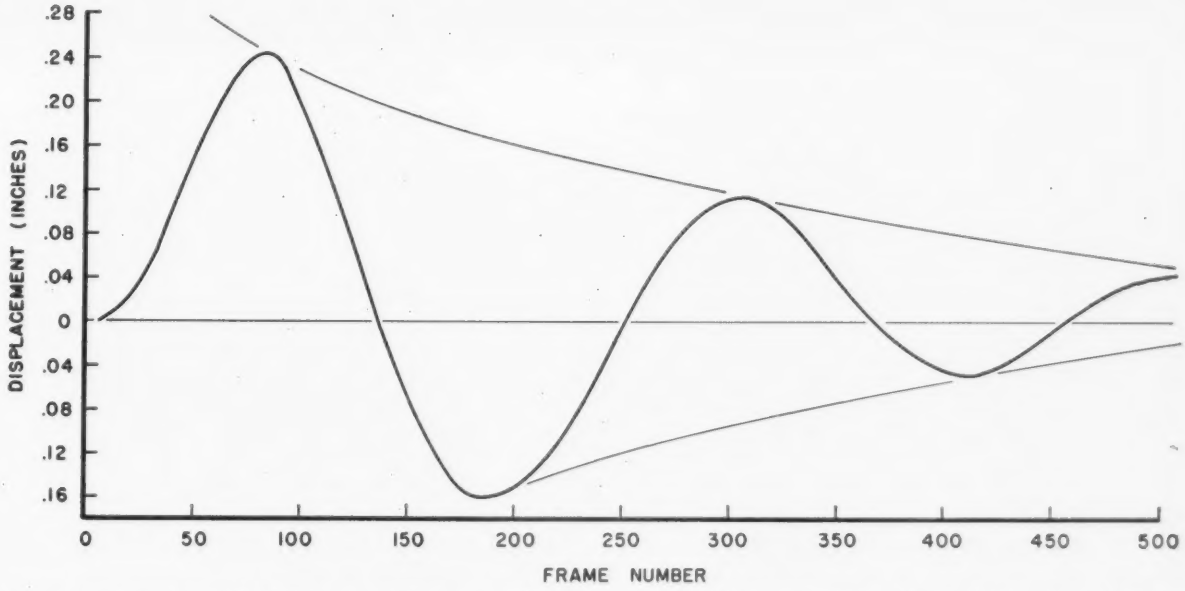

FIG. 7—Measurements of 500 frames of a picture taken at 2000 frames per second of a tire traversing a half-round cleat of one inch radius at 30 miles per hour.

Evaluation of Tire Riding Comfort. Extensive studies, using the high speed camera, were made of the action of tires going over cleats on an indoor test drum. The drum used was 6 feet in diameter, and was recessed in the floor so that a test car could be driven on top of it. Two methods of evaluating "ride" from high speed photographs were used: (1) the degree of envelopment of the cleat by the test tire, as determined by the number of frames in which the tire was observed to be entirely supported on the cleat, and (2) the amplitude and duration of axle motion as determined by measurements on the projected pictures.

The first method is illustrated by the four frames shown in Figure 5. These pictures, taken at a 30 mph wheel speed, show the tire just leaving the drum, entirely supported by the cleat and contacting the drum as it passed over the cleat.

The second of the above methods was found to have the greater power of discrimination among different test tires. In this method a rigid reference marker, having a sharp edge and corner, was attached to the axle and extended downward to within an inch of a similar marker attached to the floor of the test room. Relative movements of the two markers thus allowed measurements to be made of the true axle motion not only vertically, but fore and aft as well. The typical relative size and sequence of these two motions are plotted in Figure 6.

Two features of the vertical axle motion are important: the maximum amplitude and the time taken for the amplitude to decay to a given value. The curve shown in Figure 7 was obtained by measurements on 500 frames of a picture taken at 2000 frames per second of a tire traversing a half-round cleat of one inch radius at 30 miles per hour.

Tire Cornering Studies. An interesting high speed camera study was made of a sports car tire cornering at an 8° slip angle at 100 mph on an indoor test drum. A special loading device was used which simulated the camber of a car mounting and doubled the vertical tire load gradually during the turn, simulating the load transfer to the outboard front wheel of a car negotiating a curve.

Another application of the high speed camera to cornering studies was a series of pictures taken of a racing car negotiating a curve at the Indianapolis race track. These pictures were taken with only direct sunlight. A very clear day was necessary, however, and the time of day chosen so that the right front wheel was directly illuminated. A lens with 102 mm focal length was used, but one having a focal length of 152 mm would have been more satisfactory.

Study of Bead Rocking Problem. The use of multiple flash photography in the rubber industry can be illustrated by a study made on a problem pertaining to truck tires. Bead rocking was indicated, but it was not known whether the critical movement occurred at the heel or toe of the bead. A hole was drilled in the rim directly

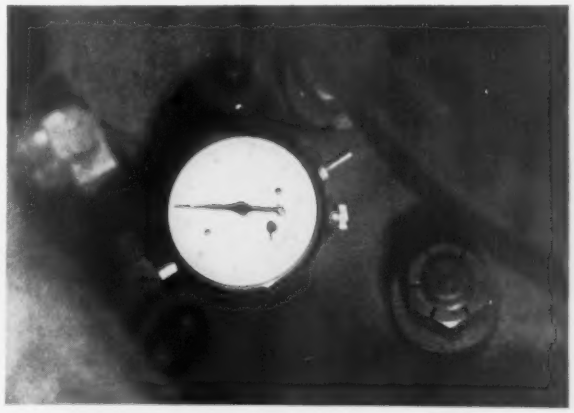

FIG. 8—Dial gage as employed in a bead rocking study, illustrating a successful use of multiple flash exposure.

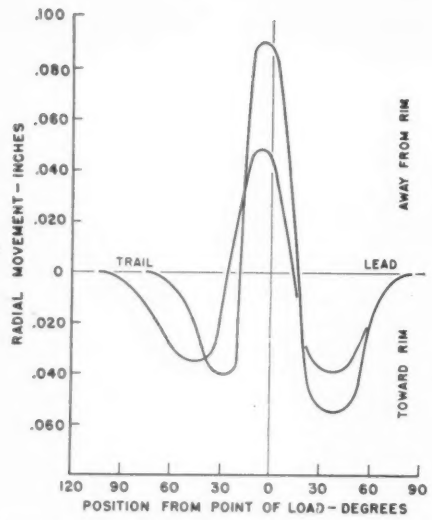

FIG. 9—Bead toe movements of a tire as the footprint region was traversed at 30 mph.

above each area, and a dial gage mounted in each so that the needle registered the distance between the rim and the bead. With the tire rotating under load on an indoor test drum, the dial face was illuminated by Strobolux light, which was timed once per tire revolution by a mechanical contactor on the wheel. Time exposure photographs were taken with a still camera of the dial face, about 30 successive flashes usually being necessary to produce a clear picture. It can be seen from Figure 8 that the multiple flash exposure did not result in a blurred picture.

The stroboscopic triggering was arranged so that the dial gage could be illuminated in any position relative to the footprint area. Results from a series of such pictures showing the bead toe movement as the footprint region was traversed at 30 mph are summarized in Figure 9.

Calibration of Brittle Point Apparatus. ASTM Specification D746-55T on low temperature brittleness testing of elastomers states that the test specimen should be bent through a 90° angle by a striker bar having a velocity at the instant of impact of 6 to 7 feet per second. High speed camera photographs were taken of the Scott solenoid apparatus, one which is commonly used for this test. When the solenoid was energized by a 120 volt supply, it was found that the striker bar was traveling at 10.8 feet per second at the moment of impact. The curve of displacement versus time, given in Figure 10, shows that the striker arm velocity was not changed by impact with the five test specimens (all of which broke on this impact). Similar graphs obtained at solenoid voltages of 80, 90, 100, and 110 yielded data which showed that for this particular unit 87.5 volts gave a striker arm velocity of 6.5 feet per second, which is in the center of the range permitted by ASTM.

Use in Tirecord Breaking Test. In a study of rupture strength of tirecord it appeared that the ultimate strength was a function of the speed of elongation. A "guillotine" breaking method had been developed whereby a loop of the test cord was struck by a pendulum at the bottom of its swing. The amplitude of the continued pendulum swing provided a measure of the energy of rupture. A method was needed, however, for determining the ultimate cord elongation. This was provided by high speed camera photography of a pointer attached to the pendulum and moving across an illuminated scale. From a plot of the pointer position versus frame number it was possible to detect both the point of contact with the cord and the point at which the cord broke, from which data the elongation was calculable.

A typical plot is shown in Figure 11. Three distinct regions of the curve shown can be seen: first, a constant velocity up to frame No. 90; second, a constantly diminishing velocity during the cord elongation up to frame 155, and, finally, another constant velocity region after the cord had broken. A more complete analysis of the data is available elsewhere *(8)*.

Physical Tests on Rubber. On a number of occasions high speed camera photographs were used to study dynamic applications of rubber. Pictures of a tear test specimen on which a grid of lines had been marked, for example, showed that strain concentrations were distributed as would be expected from the geometry of the

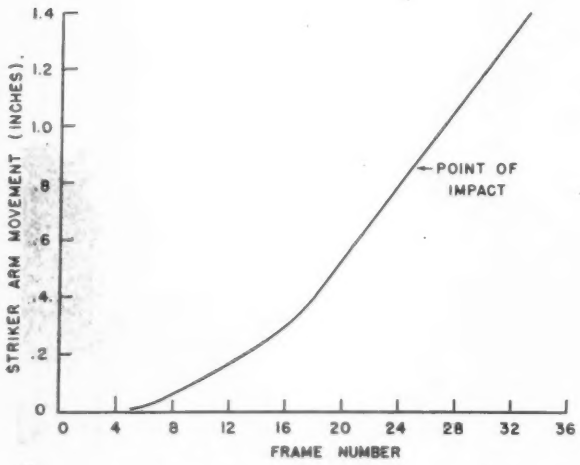

FIG. 10—Curve of displacement versus time.

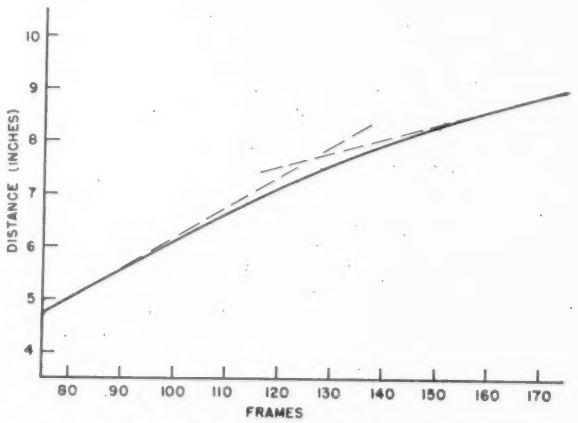

FIG. 11—Typical plot of position versus frame number from which elongation is calculated.

specimen. Static measurements had given erroneous implications because of gradual slippage at the jaws.

High speed camera photographs were made of a groove cracking sample flexing in a manner designed to emulate the action in the groove of a tire tread *(9)*. The pictures showed that high speed flexing produced essentially the same deformation pattern as did very low flexing speeds.

Limitations of the high speed camera as normally used may be illustrated by citing two types of physical tests on rubber in which it would be inadequate: (1) Retraction of tensile strips after rupture is too fast to be photographed clearly at film speeds of 3000 frames per second or lower, and (2) Cell wall action in sponge rubber flexure would not be clearly shown at maximum magnification provided by the standard lenses, since the cell size as photographed would not be appreciably larger than the film grain.

Special Applications. Useful information has been obtained with high speed special photography on such diverse operations as tread siping, tread stitching, bead winding, fabric processing and the action of airplane tires upon landing.

ACKNOWLEDGMENT

The permission of Firestone Tire and Rubber Co. to publish these results is greatly appreciated. Acknowledgment is also made of the cooperation extended by the personnel of the various departments in which the above work was done.

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Permanent, Non-Skid Backing for Rugs

THE task of applying a permanent, non-skid backing to throw rugs used in staterooms of ocean liners has been solved by Sanitary Laundry and Dry Cleaners, San Francisco, Calif., according to a recent report. Non-skid rugs are of special importance on luxury liners since they are placed on waxed rubber tile flooring where constant ship motion promotes slippage. Initial cleaning of the rugs formerly completely removed backsizing, presenting possible threats to passenger safety.

Following numerous tests with various backing materials, Sanitary solved the problem by spray-applying a combination of Chemigum Latex 245 and Pliovic Latex 300, two synthetic latices produced by the Chemical Division of Goodyear Tire & Rubber Co.

The former, a nitrile type polymer, was chosen for its inherent oil and solvent resistance and chemical and mechanical stability. Pliovic Latex 300, an aqueous dispersion of a vinyl chloride copolymer, was selected to form tough, thin films with permanent adhesion properties that withstand repeated washing. The two latices complement each other and may be modified to yield a wide range of physical properties.

Latices for backsizing applications are selected for their ability to impart specific properties which may be accentuated by further compounding. Filler can be added to increase stiffness and weight and to extend the latex. Thickening agents provide proper coating consistency and color pigments add to sales appeal. Surface active agents facilitate penetration and adhesion, while curing agents furnish over-all strength characteristics.

Backsizing is becoming an increasingly important step in the manufacture of rugs and carpeting. Backsizing materials bind the pile securely to the yarn back, increase weight, improve stiffness and protect against raveling and pulling of pile tufts. In addition, backsizing provides important anti-skid properties and increases over-all service life of the rug.

Having found that the Chemigum-Pliovic latex combination furnished the required anchorage, Sanitary initiated a search for appropriate application equipment. After experimenting with various spray guns, none of which proved satisfactory for this particular purpose, the cleaning firm designed its own eqiupment.

A pressure pot was formed from a short piece of eight-inch pipe. A supply opening, an air inlet, 70 pounds of air pressure, an air supply hose from a home garden sprayer, a squeeze valve and a spray nozzle completed the set up.

This apparatus holds more than three gallons of the latex mixture and can spray several four-by-six-foot rugs in a matter of minutes. In addition to throw rugs, Sanitary is now using the mixture and spray apparatus on bath mats, grass matting and conventional home-use cotton loop rugs.

The throw rugs for which the manufacturing process was developed are said to be completely and satisfactorily cleaned without removing the back-sizing material. The safety factor involved in an operation of this type, in which it is necessary that adequate protection be provided without fail, is thus assured without resort to special checking of rugs to see the conditions of their backing. The safety margin is further increased by the fact that the two latices may be modified to provide in combination the specific physical properties needed to produce the backsizing material most suitable for a rug as determined by its intended use.

Pre-Dispersed Accelerators in Rubber Compounds

By JOHN WARE
Ware Chemical Corp., Westport, Conn.

Pre-dispersion offers:
Greater efficiency
Reduction in heat history
Other compounding advantages

THE technique of pre-dispersing active materials is not new. The need for such treatment of colors has long been recognized. Aqueous dispersions of accelerators for latices is commonplace. Applying this procedure to rubber compounds has been done occasionally to overcome some specific difficulty. Some of the hard rubber manufacturers stir the sulfur into oil before using it.

The need for pre-dispersed accelerators became obvious when the cable manufacturers tried to meet specifications with certain butyl rubber compounds using light powdery GMF or Dibenzo GMF, or finely divided red lead. The butyl compounds are inherently soft, so that high shearing action could not be obtained. It has been pointed out that first masterbatching the accelerator in butyl rubber was wrong *(1)*. The resulting masterbatch was stiffer than the base compound and poor dispersion resulted.

By thoroughly dispersing the accelerator in a suitable plasticizer, instead of in rubber, it is possible to introduce the active material into a factory batch quickly, uniformly and at low temperature with freedom from agglomerates. This treatment overcomes the serious problem of agglomerates in thin wall insulation. It also offers a solution to the problem of introducing accelerators and sulfur when the cold feed method is being used.

As far as we can determine, and we have tried many types of dispersing devices, a three-roll ink mill is the best equipment to use to prepare a dispersion of accelerators. In this device, every single particle must be subjected to the smearing, grinding action of the tightly closed rolls running at differential speeds. There can be no short-circuiting to permit an elusive agglomerate to reach the finished products. Two passes through the mill are sufficient in most cases. Some materials are hard to wet and require more passes.

Other lower cost methods are available but the dispersions are not as good as those prepared on a three-roll mill. They may be good enough but until we develop our technique for evaluation of these products, we believe that only the best method should be used.

Test of a GMF Dispersion

An examination of a 62½% GMF dispersion from a commercial production run was made to determine particle size and fineness of grind. Hageman fineness of grind gauge was used after diluting the stiff samples with light process oil. This was necessary to make the measurements. There is considerable improvement between one pass and two passes. The Hageman reading, after one pass, varied from 0 to 5 (New York Production Club Scale) *(2)* but was clean up to five units on the scale after two passes. The particle size distribution ranged from 2 μ to 8 μ, measured with the microscope, for both cases. But most significant is that the maximum size of occasional scattered agglomerates was reduced from 120 μ after one pass to 40 μ after two passes. This also indicated that two passes were essential.

Because the particles are completely wetted out, there is no reason for re-agglomeration, settling, or separation to take place if the motility is reduced to zero by the stiffness of the product. Further study is needed of particle size in the rubber compound before vulcanization. This was not undertaken for lack of adequate equipment.

The finished dispersion properly made can be a firm paste, obviously free from dust, which can be cut with a knife like a piece of cheddar cheese and conveniently weighed out and handled with little or no loss. It can be added to the Banbury without seriously fouling the throat or ram, or it can be thrown on the mill without fouling the guides and with little or no fall through to the pan.

It is also highly desirable to make these dispersions with whatever plasticizer or combination of plasticizer is preferred by the compounder. Oils are preferable to resinous types. Because of the inherently sticky nature of the lower melting point resins, dispersions made with them are often too sticky to handle easily and weigh. Apparently, all dry powdered ingredients lend themselves to this treatment. At least we have prepared many of the common ones and have encountered no difficulty.

In making up combinations of complete accelerations, occasionally we have found evidence of physical change in consistency taking place at room temperature upon standing. Two different combinations containing 2-

Note: This paper was presented at the Sixth Annual Symposium on "Technical Progress in Communication Wires and Cables," sponsored by the Communications Department of the U. S. Army Signal Engineering Laboratories, Asbury Park, N. J., December 4, 1957.

mercaptobenzothiazole and lead oxide plus other components changed from a firm pasty consistency to a hard crumbly mass. This probably indicated some chemical interaction but they behaved satisfactorily when used in a rubber compound.

Ease and Speed of Dispersion

In spite of the firm body, a good dispersion will disperse rapidly even in cold rubber because of the low viscosity and compatability of the vehicle. Because one of the important advantages of the dispersion is the ease and speed of incorporation, we believe that the less the amount of extraneous material, such as a polyethylene bag, a clay filler or other stiffeners added with the dispersion, the better.

The use of such pre-dispersed products overcomes all hazards from toxic or explosive dusts. There is freedom from agglomerates and greater assurance of uniformity. This means better cured rubber. There is less chance of under-concentration or over-concentration in spots. As a further refinement, if all the ingredients of the accelerator system are first intimately mixed in the correct proportions and incorporated into one dispersion, one can reasonably expect superior results.

In this form, the time and work needed to obtain a good mixture is greatly reduced either on the mill or in the Banbury. In one factory test, a combination dispersion containing ten parts of red lead, six parts of Dibenzo GMF and one part of sulfur was introduced into the butyl rubber compound on the warm-up mill in half the time it took to incorporate the dry powdered ingredients. The mill operator was able to remove the batch from the mill with his bare hands, whereas formerly, because of the temperature rise, he had been obliged to use gloves. Several users of dispersed litharge have reported that it provided practical control of scorch in otherwise scorchy Hypalon compounds.

An old trick also comes into use here in that plasticizer is being added simultaneously with the acceleration which helps to cool the batch. The shorter milling time, the lower temperatures and freedom from zones of over-concentration should result in less scorch and longer bin storage life.

Continuing reports from users indicate that the low heat history which can be obtained is perhaps of prime importance. If scorching or early cure can be avoided when the accelerators are introduced, many benefits accrue. One user reported that he more than doubled the speed of his extruder when he switched from dry GMF to dispersed GMF. The governing factor was the surface smoothness of the extruded stock. This also led to less overcure in the CV.

We have not had enough factory experience to make the broad claim that when all accelerators are so dispersed they become more efficient and more active and that lower concentrations can be used. We have had several reports that the CV had been speeded up as much as 25% when dispersed GMF or dispersed Dibenzo GMF was used instead of the powdered materials. Perhaps we should regard these dispersions not as a potential means of reducing the absolute amount of the chemical used, but rather as insurance of good performance in the factory.

A number of compounders are using more than the minimal dose of dry material to obtain freedom from trouble in production with great success. For example, they are using three parts of GMF instead of two or 7.5 parts of Dibenzo instead of six. It may be that two parts of GMF dispersed or six parts of Dibenzo dispersed may afford that same guarantee of production performance without resorting to the higher dosages. The better protection from scorch would be an added dividend. Also, it is to be expected that the electricals would be better because of the superior dispersion of the chemicals in this form. Unfortunately, we are not presenting electrical information at this time because of laboratory limitations.

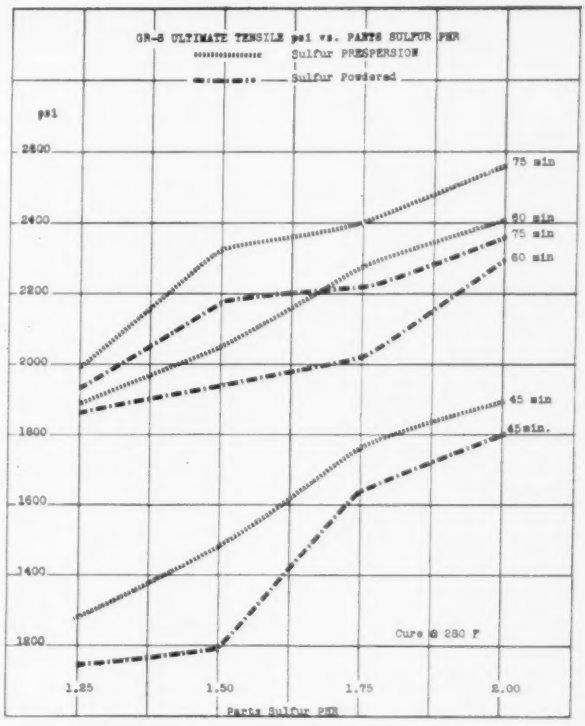

FIG. 1—Effects of dry and dispersed sulfur on ultimate tensile strength of a styrene rubber compound.

TABLE I—FORMULA FOR STYRENE RUBBER RH-HW INSULATION COMPOUND

BASE COMPOUND

	Parts
GR-S 1503	75
GR-S 1018	25
Stearic Acid	1
Zinc Oxide	50
Agerite White	2
Agerite Resin D	1
MR 200° F.	30
Heliozone	4
Atomite	50
Whitetex Clay	75

Compound	1	2	3	4	5	6	7	8	9	10
Light Process Oil	5.00	2.16	5.0	2.26	5.00	2.38	5.00	2.48	5.00	2.59
MBTS	1.00	1.5[a]	1.0	1.5[a]	1.00	1.5[a]	1.00	1.5[a]	1.00	1.5[a]
Bismuth Dimethyl Dithiocarbamate	3.00	4.8[b]	3.0	4.8[b]	3.00	4.8[b]	3.00	4.8[b]	3.00	4.8[b]
Sulfur	1.25	1.79[c]	1.0	1.44[c]	0.75	1.07[c]	0.50	0.72[c]	0.25	0.36[c]

a = 66 2/3% dispersion; b = 62½% dispersion; c = 70% dispersion.

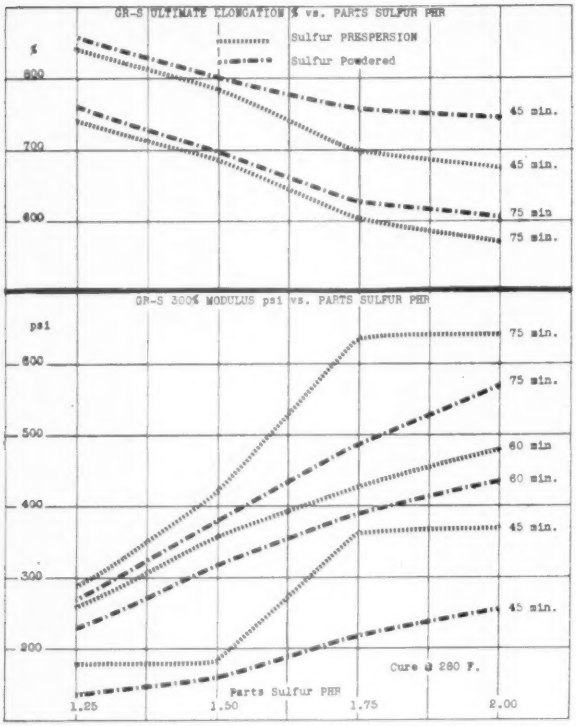

FIG. 2—Effects of dry and dispersed sulfur on ultimate elongation and modulus of a styrene rubber compound.

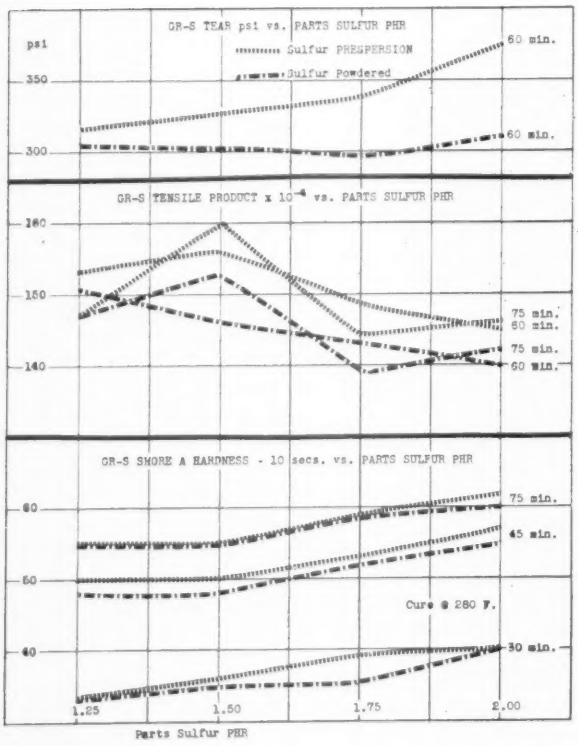

FIG. 3—Effects of dry and dispersed sulfur on tear strength, tensile product $\times 10^{-4}$ and Shore A hardness of a styrene rubber compound.

TABLE II—PHYSICAL PROPERTIES OF UNAGED STYRENE RUBBER RH-HW INSULATION COMPOUND WITH DRY AND DISPERSED SULFUR

Compound		1	2	3	4	5	6	7	8	9	10
Sulfur (dry)		1.25	—	1.0	—	0.75	—	0.5	—	0.25	—
Sulfur (disp.)		—	1.25	—	1.0	—	0.75	—	0.5	—	0.25
Cure Time @ 388° F.											
10 secs.	H	56	59	53	55	49	52	46	48	UC	UC
	S	160	165	155	160	160	170	150	155	UC	UC
	T	1175	1335	1030	1300	940	1000	670	785	UC	UC
	E	755	695	920	895	1035	1000	1090	1075	UC	UC
15 secs.	H	61	62	59	60	54	55	49	50	UC	45
	S	230	240	225	230	205	250	150	160	UC	160
	T	1310	1320	1175	1320	1125	1180	840	980	UC	400
	E	605	565	720	675	875	845	1075	1020	UC	1200
20 secs.	H	62	63	59	60	55	56	52	54	UC	47
	S	220	245	240	230	230	255	160	160	UC	165
	T	1220	1235	1115	1200	1020	1165	970	995	UC	495
	E	555	535	670	625	780	795	1020	935	UC	1180
30 secs.	H	62	64	59	60	55	57	52	54	45	48
	S	235	255	230	230	205	245	160	165	160	170
	T	1185	1180	1140	1170	1070	1145	950	1030	540	590
	E	555	520	620	610	760	755	935	885	1210	1020
45 secs.	H	63	64	59	60	55	57	52	55	45	49
	S	230	245	230	240	225	230	210	240	150	165
	T	1140	1155	1060	1080	1050	1040	1010	1040	570	645
	E	510	510	570	605	720	735	900	810	1130	1025
60 secs.	H	63	64	59	60	56	57	53	55	45	49
	S	250	255	220	230	220	240	230	250	150	155
	T	990	1180	1065	1070	1010	1050	990	1000	545	615
	E	500	505	575	600	755	720	875	835	1100	1010

H = Shore hardness A, 10 seconds; S = 200% modulus, psi; T = Tensile, psi; E = Ultimate elongation, %

Change in Character of Chemicals

We are just beginning to accumulate enough laboratory data to see that active chemicals well dispersed are different animals. Even the leopard loses its spots if he happens to be MBTS, Tellurac or zinc oxide. We have have seen a great reduction in down time for cleaning strainers when a dispersion was used in the case of one bad actor.

We want to stress the difficulty of obtaining conclusive data in the laboratory. Laboratory milling is always better than factory milling. Differences that would show up in production between dry and pre-dispersed materials cannot be clearly shown in the laboratory. Saving in milling time is not too apparent, and the difference in work required to introduce and distribute small quantities is hard to measure.

Mooney readings on samples compounded in the laboratory will not reflect the lower scorch obtained by the use of dispersions in factory size batches due to the reduced heat history. Of course, there is no laboratory instrument for predicting the per cent of cable failure, patching costs and factory scrap due to poor dispersion.

As difficult as it is to obtain good data in the laboratory, it is even more so to get pertinent factory data. We do get qualitative reports and comments but little quantitative evidence is available for obvious reasons. We think an appeal is in order here to set up some sort of clearing house for actual factory performance data on results obtained with these and other new materials. This may be a radical departure from usual competitive practice, but we think that managements could be made to see that there is more to be gained in furthering the art by pooling information than by keeping it secret.

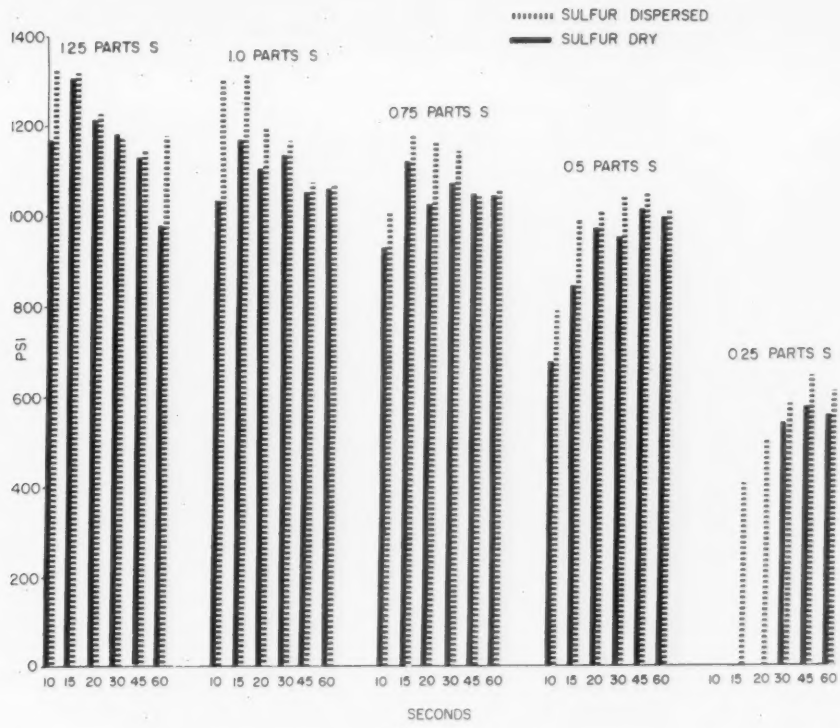

FIG. 4—Effects of dry and dispersed sulfur on original tensile versus cure time at 388°F. open steam of a styrene rubber compound.

As has been observed, correlation between laboratory experiments with dry accelerators and factory runs is not good. We are beginning to find that the reverse holds true for studies made with dispersed materials in the laboratory and in the factory. Apparently, the quality of the dispersion in the factory batch will approach that of a laboratory experiment if dispersed materials are used.

We did find that differences in the performance of powdered sulfur and pre-dispersed sulfur were quite clear even in the laboratory. Our first exploratory work was with a simple styrene rubber compound. The formula was as follows:

	Parts
GR-S 1000	100
EPC Black	45
Zinc Oxide	3
Paraflux	6
Sulfur	Varied from 1.25 to 2

The curves in Figures 1 through 3 show the effect of using dry sulfur versus sulfur Prespersions (70% rubbermakers' sulfur dispersed in process oil) in the compound. When the Prespersion was used the amount of plasticizer (Paraflux) introduced was lowered to maintain a total plasticizer constant at six parts.

The milling time for the preparation of each sample was kept constant. The total plasticizer content was identical in each case. It is apparent that optimum cures can be reached in less time and with less sulfur. Tensiles are higher, modulus is up and reaches a plateau, elongation is less, tear is higher, tensile product is greater and hardness is slightly raised. The sulfur certainly behaved differently when it was dispersed.

In considering pre-dispersed products, it must be recog-

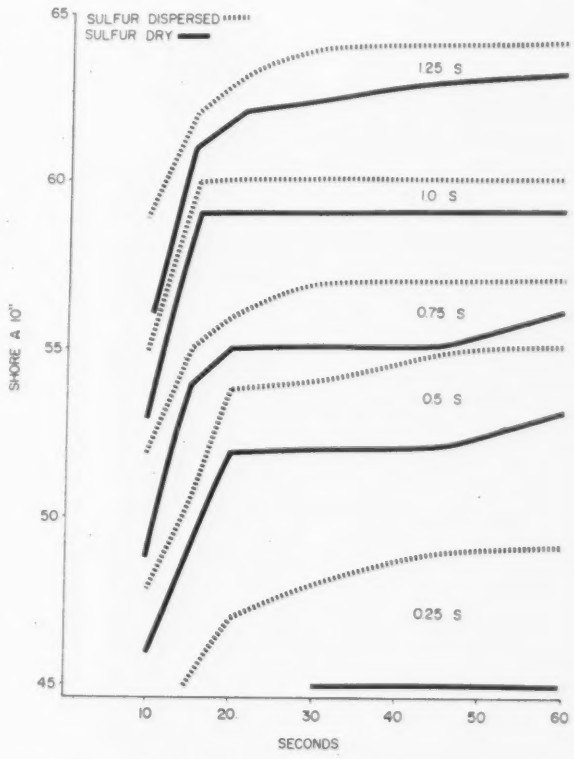

FIG. 5—Effects of dry and dispersed sulfur on hardness versus cure time at 388°F. open steam of a styrene rubber compound.

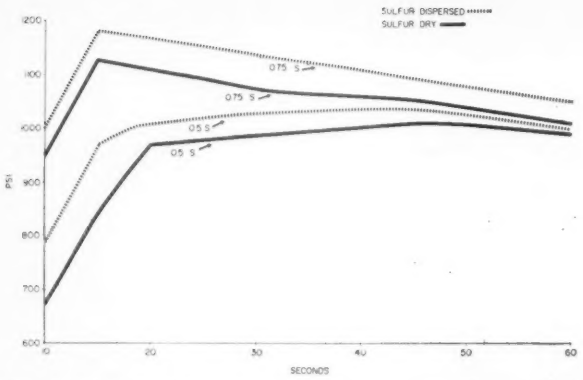

FIG. 6—Effects of dry and dispersed sulfur versus cure time at 388°F. on original tensile of a styrene rubber compound.

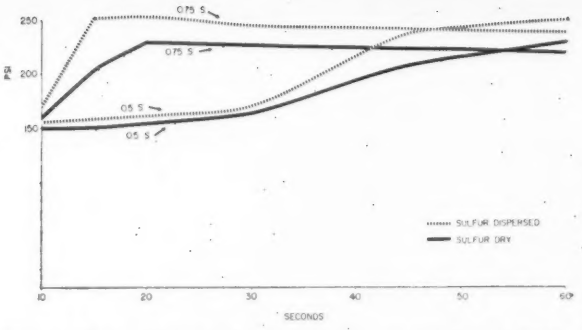

FIG. 7—Effects of dry and dispersed sulfur versus cure time at 388°F. on original modulus 200% of a styrene rubber compound.

nized that we are not just using a material in a more convenient form, but a different thing entirely, as different say as MBT and MBTS.

Styrene Rubber RH-RW Insulation Compound

If we could obtain tighter cure with less sulfur, we expected to improve heat aging. To determine this, we studied a styrene rubber RH-RW insulation. The formula is given in Table I. In the control, dry ingredients were used and the second series (even numbered compounds) employed pre-dispersed MBTS (one part), bismouth dimethyl thiocarbamate (three parts) and sulfur varying from 1.25 parts to 0.25 parts. The compounds all contained the same total plasticizer.

Correction was made for the oil introduced with the dispersions. Milling time was constant for all mixes. All testing was done by the same individual on the same equipment. The data is the average of the best two out of three readings. Cure time was varied from 10 seconds to 60 in open steam at 388°F. *(3).*

The original results are shown in Table II. The differences in the physical properties are not great between the two series over a range of cures and sulfur ratios but datum by datum the compounds with the dispersed accelerators and sulfur consistently show better physicals. This is significant. On a factory scale we would expect these differences to be greater. Furthermore, at 0.25 sulfur in dry form the compounds were not cured at 10, 15 and 20 seconds, whereas with the pre-dispersed materials at the same concentration, cures were obtained at 15 and 20 seconds, indicating greater activity.

The bar chart, Figure 4, shows clearly that in every single case but one, the tensiles are higher for the compounds with dispersed materials. Figure 5 shows the consistent difference in Shore A hardness. It is only a point or so at the highest sulfur level but as the sulfur is reduced the difference in hardness increases steadily. These differences in hardness and also in elongation indicate faster initial cure at the lower concentrations when the materials are dispersed.

Because we are particularly concerned with heat aging at the lower sulfur levels, attention is called to Figures 6, 7 and 8 showing readings of initial tensile, modulus and elongation for various times of cure at 0.75 and 0.5 parts of sulfur. In examining the curves in Figure 6 for tensile, it is obvious that as the sulfur is reduced from 0.75 to 0.5 parts, the curves become flatter and the point of optimum cure is not nearly as critical. If similar results could be obtained with natural rubber and neoprene, it could be used to advantage in avoiding trouble from overcures.

In each comparison, the compounds with dispersed material give indication of tighter cure. An examination of the data shows that it is possible to get the same state of cure with 0.5 parts of dispersed sulfur in 45 seconds as is obtained with 0.75 parts of dry sulfur in 20 seconds. We have reduced the sulfur and kept the accelerators at a fixed concentration. We believe that if the concentration of accelerators is increased, we can reach the same state of cure with 0.5 parts of sulfur in 20 seconds instead of 45, and thus enjoy the benefits of low sulfur

TABLE III—PHYSICAL PROPERTIES OF AIR BOMB AGED STYRENE RUBBER RH-HW INSULATION COMPOUND WITH DRY AND DISPERSED SULFUR

AGING: 20 HOUR AIR BOMB @ 260°F. AND 80 PSI

Cure Time @ 388°F.		Parts sulfur 1.25 Dry	1.25 Disp.	1.0 Dry	1.0 Disp.	0.75 Dry	0.75 Disp.	0.5 Dry	0.5 Disp.	0.25 Dry	0.25 Disp.
10 sec.	S	640	590	560	480	570	590	460	515	340	395
	T	880	830	800	960	870	890	770	865	730	670
	%T	74	62	77	74	92	89	113	110	—	—
	E	385	380	450	485	585	605	715	710	740	855
	%E	51	55	49	54	56	60	65	66	—	—
15 sec.	S	630	620	580	515	565	565	450	470	310	380
	T	860	855	855	950	970	1050	830	980	770	620
	%T	65	64	72	72	86	89	98	100	—	155
	E	330	320	410	410	575	575	730	760	750	845
	%E	54	57	57	61	66	68	68	74	—	70
20 sec.	S	595	580	500	475	540	570	485	455	380	310
	T	825	830	825	920	850	980	890	980	770	620
	%T	67	67	74	77	83	84	92	98	—	125
	E	305	295	385	390	535	560	725	710	750	890
	%E	55	55	57	62	68	70	71	76	—	75
30 sec.	S	575	555	510	475	485	540	400	410	370	330
	T	810	800	820	915	900	980	880	980	725	740
	%T	68	68	72	78	84	85	92	95	134	124
	E	300	285	365	375	530	550	685	690	860	795
	%E	54	55	58	62	70	73	73	78	71	76
45 sec.	S	530	535	515	490	510	525	365	405	340	315
	T	830	790	825	830	870	880	880	950	710	780
	%T	72	69	78	76	83	84	87	91	124	121
	E	280	285	340	390	470	530	685	635	825	750
	%E	55	55	59	64	65	73	76	78	73	75
60 sec.	S	520	530	380	380	445	520	385	390	250	295
	T	745	775	800	840	825	880	880	940	670	800
	%T	75	65	75	76	81	83	89	94	122	130
	E	275	270	340	395	500	520	680	615	800	765
	%E	55	54	59	65	66	73	78	74	72	75

S = 200% modulus, psi; T = Tensile, psi; %T = Per cent tensile retained; E = Elongation, %; %E = Per cent elongation retained.

without sacrificing time in the CV. Judging from the similar shapes of each pair of curves and the similarity of time for optimum cures, the activity of the dispersed accelerators was not increased as compared to the dry ingredients. Some difference may show up in the factory.

Air Bomb and Oven Heat Aging

Table III shows the results of 20 hour air bomb aging at 260° F. and 80 psi. The per cent retained of original elongation is higher for the compounds made with dispersed materials with the exception of the pair run at 1.25 parts of sulfur. Gaining a few per cent in the percentage retained may represent a very large increase in the "leeway" above minimum percentages required to pass the specifications. Figure 9 shows clearly that at the 0.75 and 0.5 parts of sulfur, the margin of safety is significantly increased. Comparing the two optimum cures, compound 5 at 20 seconds with compound 8 at 45 seconds, the first retained 68% elongation and the latter 78%.

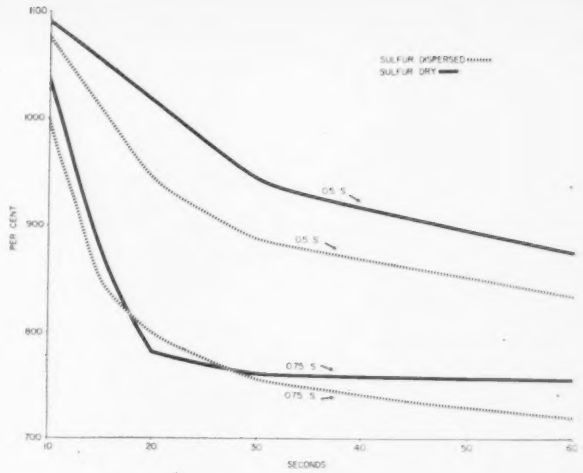

FIG. 8—Effects of dry and dispersed sulfur versus cure time at 388° F. on original elongation of a styrene rubber compound.

TABLE IV—PHYSICAL PROPERTIES OF AIR OVEN AGED STYRENE RUBBER RH-HW INSULATION COMPOUND WITH DRY AND DISPERSED SULFUR

AGING: 7 DAY AIR OVEN @ 121° C.

Cure Time @ 388° F.		Parts sulfur 1.00 Dry	1.00 Disp.	0.75 Dry	0.75 Disp.	0.50 Dry	0.50 Disp.
10 sec.	S	505	550	425	415	415	330
	T	930	1000	840	825	650	820
	%T	86	79	89	86	98	102
	E	520	560	655	680	865	845
	%E	54	64	65	68	78	80
15 sec.	S	535	530	435	430	360	430
	T	890	980	880	960	800	905
	%T	76	75	79	85	92	93
	E	410	415	520	545	805	790
	%E	58	61	60	64	75	76
20 sec.	S	530	520	440	415	350	390
	T	880	870	800	920	870	905
	%T	76	72	77	81	90	89
	E	360	380	480	485	750	730
	%E	55	60	63	61	73	76
30 sec.	S	515	530	415	425	410	330
	T	845	845	870	930	815	900
	%T	73	74	80	80	84	86
	E	340	365	445	440	675	630
	%E	53	59	61	59	71	74
45 sec.	S	515	485	420	400	370	420
	T	775	775	830	880	890	920
	%T	71	73	81	83	87	87
	E	300	335	415	455	640	595
	%E	52	56	57	62	70	73
60 sec.	S	465	470	390	355	390	385
	T	710	725	825	880	880	860
	%T	66	68	81	83	88	83
	E	275	305	400	440	610	625
	%E	49	51	57	62	70	73

S = 200% modulus, psi; T = Tensile, psi; %T = Per cent tensile retained; E = Elongation, %; %E = Per cent elongation retained.

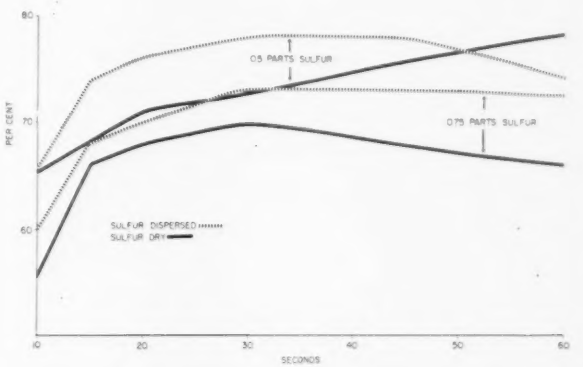

FIG. 9—Effects of dry and dispersed sulfur versus cure time at 388° F. on per cent elongation of a styrene rubber compound retained after air bomb aging 20 hours at 260° F. and 80 psi.

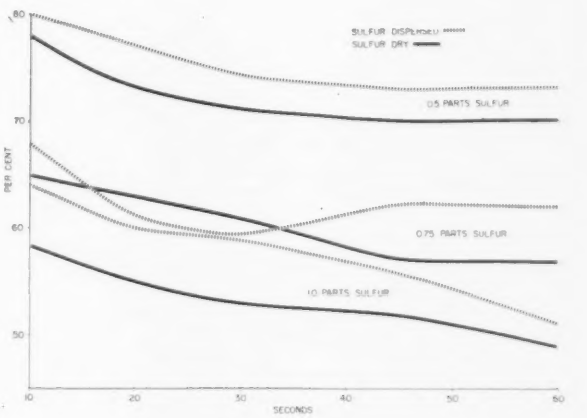

FIG. 10—Effects of dry and dispersed sulfur versus cure time at 388° F. on per cent elongation of a styrene rubber compound retained after air oven aging for 7 days at 121° C.

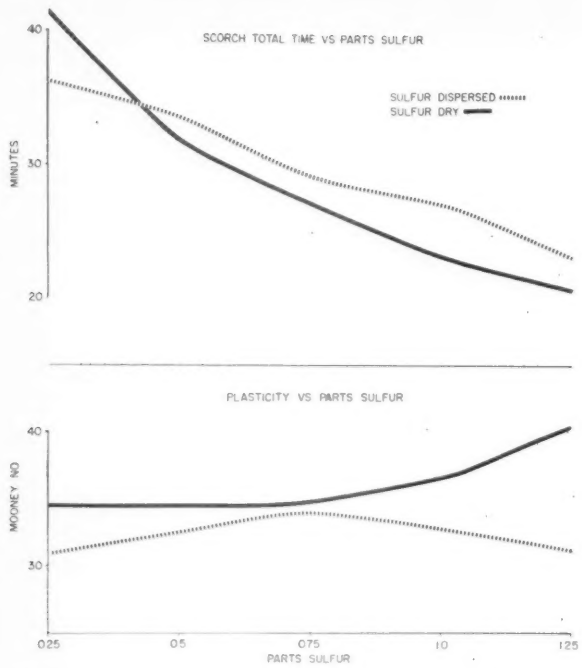

FIG. 11—Effects of dry and dispersed sulfur on scorch time and Mooney plasticity at 250°F. of a styrene rubber compound.

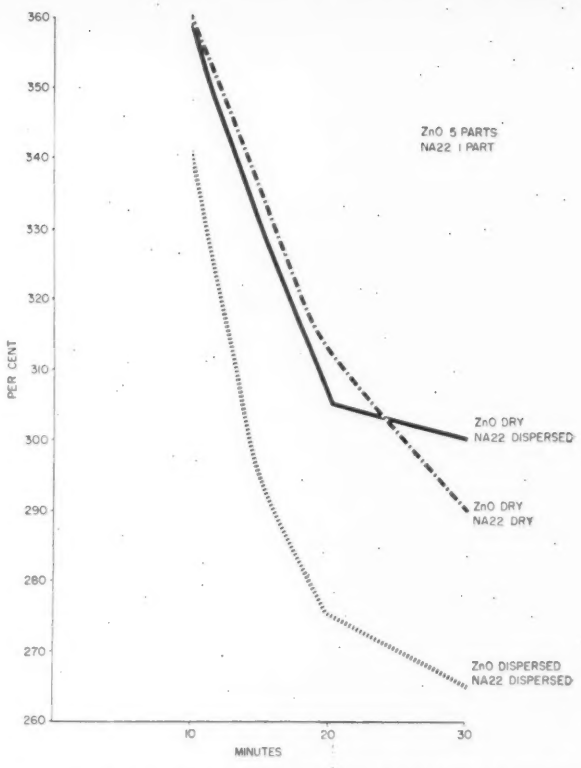

FIG. 13—Effects of dry and dispersed zinc oxide and NA-22 in varying combinations versus press cure time at 307°F. on original elongation of a Neoprene W compound.

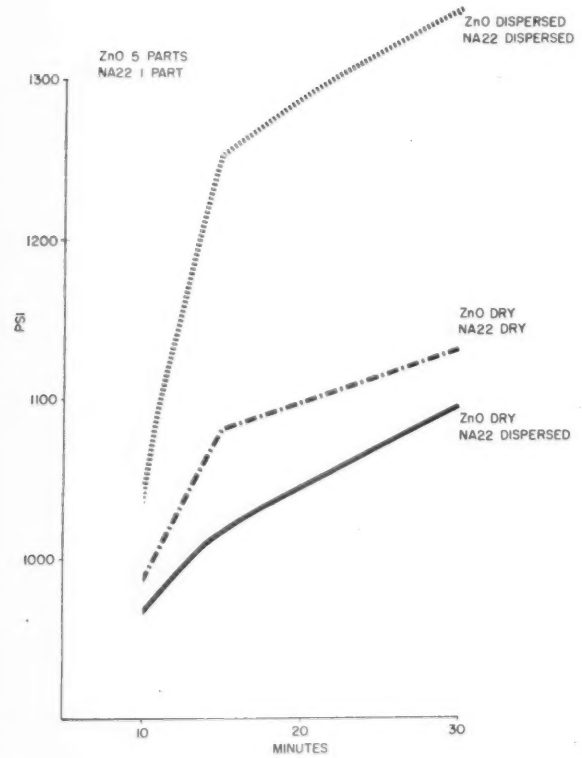

FIG. 12—Effects of dry and dispersed zinc oxide in varying combinations versus press cure time at 307°F. on original modulus 200% of a Neoprene W compound.

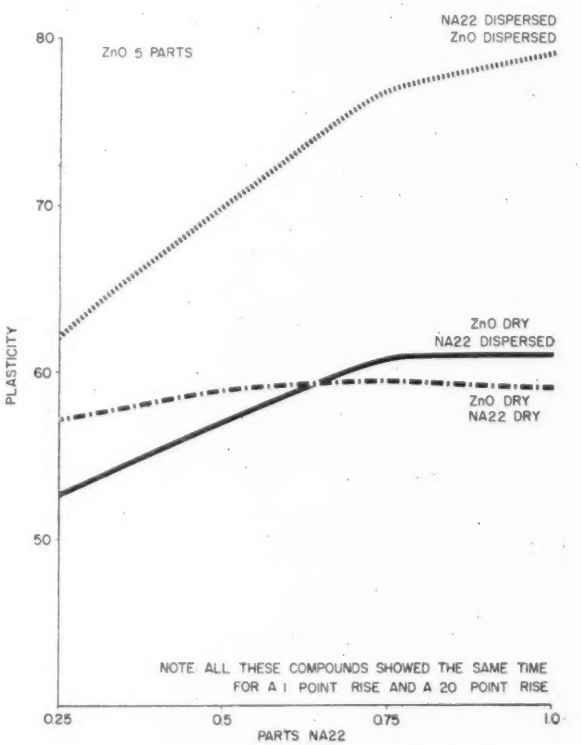

FIG. 14—Effects of dry and dispersed zinc oxide and NA-22 in varying combinations versus parts of NA-22 in a Neoprene W compound on Mooney plasticity at 250°F.

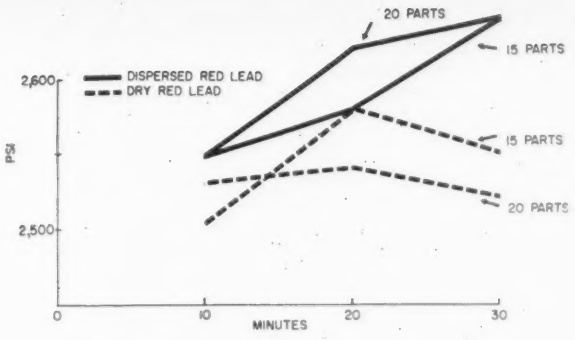

FIG. 15—Effects of dry and dispersed red lead versus cure time at 307°F. on original tensile of a Neoprene W compound.

The results of aging in the air bomb were so encouraging that we cured another set of slabs from the same stocks of compounds containing 1, 0.75 and 0.5 sulfur and repeated the original physical tests for control so that we could run an air oven aging test. The results of the test run after seven days at 121°C. are shown in Table IV. Again, the over-all picture showed better retention of physicals with the dispersed products, as shown in Figure 10. Retention of elongation with 0.5 sulfur dispersed was 73% at optimum cure. Originally we intended to run the test for ten days but were warned that the test would be too severe. It would appear that perhaps these compounds would have withstood the longer test, and we hope somebody confirms this conjecture.

Mooneys were run at 250°F. on the uncured stocks 60 days after they were compounded. The samples were kept in a room subjected to summer temperatures from July to September. The results are the average of two sets of readings. The stocks containing the dispersed materials show consistently two to three minutes greater total time with the exception of the compounds containing 0.25 sulfur.

Plasticity of the dispersed compounds is lower. Data are shown in Table V. It appears that the dispersed material in spite of its increased activity is also safer (Figure 11). There is less danger from scorch due to over-concentration. From a production standpoint, having a safer compound with lower plasticity is certainly valuable and an asset for cold feed. We must stress again that there probably would be greater differences in factory size batches.

TABLE V—MOONEY SCORCH DATA ON STYRENE RUBBER RH-RW INSULATION

	MOONEY SCORCH @ 250°F.									
Compound	1	2	3	4	5	6	7	8	9	10
Sulfur (dry)	1.25	—	1.0	—	0.75	—	0.5	—	0.25	—
Sulfur (disp.)	—	1.25	—	1.0	—	0.75	—	0.5	—	0.25
Time scorch begins (mins.)	15.0	16.5	17.0	19.5	19.5	23.0	22.5	26.00	29.5	28.0
Time 5 pt. rise	5.5	6.5	6.0	7.5	7.5	6.0	9.0	7.50	12.0	8.0
Total time	20.5	23.0	23.0	27.0	27.0	29.0	31.5	33.50	41.5	36.0
Rate last min.	3.5	4.0	1.5	2.75	1.5	2.25	1.5	2.25	1.25	1.5
Plasticity	40 25	31.0	36.5	32.50	34.75	34.0	34.5	31.75	34.5	31.0

We had hoped to show an improvement in mechanical water absorption with the use of the dispersed materials but there was no significant difference between pairs of compounds in spite of the tighter cure obtained with the dispersed materials.

Type W Neoprene Black Jacket Compound

Another study was made on the Type W Neoprene black jacket compound shown below:

Neoprene Type W	100.0
Neozone D	2.0
Magnesia	4.0
SRF Carbon Black	20.0
MAF Carbon Black	20.0
Hard Clay	50.0
Sun-checking Wax	3.0
Light Process Oil	12.0
Zinc Oxide	5.0
NA-22	Varied from 0.25 to 1.0

Slabs cured 10, 15, 20, 30 minutes at 307° F. in press

We varied the NA-22 from one-quarter of a part to one part and kept the zinc oxide constant at five parts. The first series used all dry ingredients. The second used dry zinc oxide and pre-dispersed NA-22 material. The third used all dispersed materials. We hoped to show that less NA-22 could be used, that the compound would be less scorchy and that an optimum cure could be reached in less time. These data are available upon request.

The differences in the results obtained with dry NA-22 and those obtained from dispersed NA-22 were small. As usual, in the laboratory, the differences were masked by the excellent milling. Furthermore, milling time was kept constant for all samples and the cures were press cures. There was some indication that perhaps three-quarters of a part of NA-22 would be sufficient, and we expect factory tests may confirm this.

The Mooney data showed absolutely no differences in scorch time. However, when we compared the compounds containing dry zinc oxide versus dispersed zinc oxide at one part of NA-22, a marked difference appeared. The modulus (Figure 12) increased, elongation (Figure 13) was lower and even hardness was

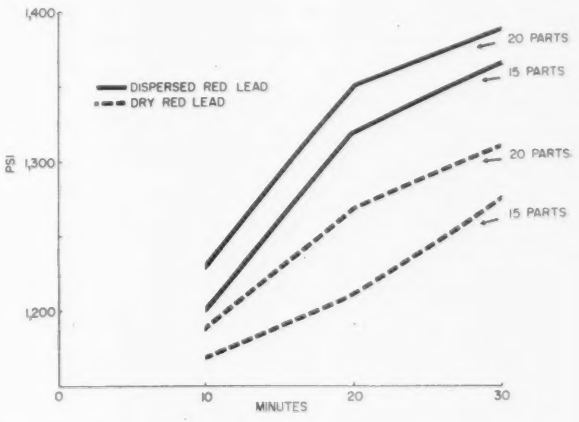

FIG. 16—Effects of dry and dispersed red lead versus cure time at 307°F. on 200% modulus of a Neoprene W compound.

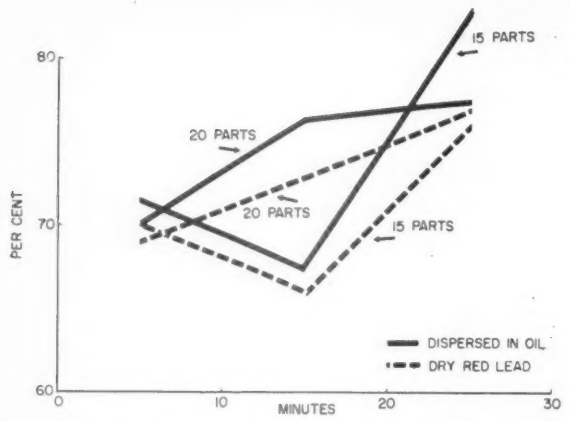

FIG. 17—Effects of dry and dispersed red lead versus cure time at 307° F. on per cent elongation retained by a Neoprene W compound oven aged for 7 days at 70°C.

slightly higher. There was no great difference in tensile strength. The Mooney scorch and cure times were identical but the plasticity was indeed different (Figure 14). If this result can be confirmed by repeated tests, the behavior of pre-dispersed zinc oxide would be clearly that of a different substance.

Further work must be done after we have established the optimum concentration of NA-22 to determine what results can be obtained with varying amounts of zinc oxide. We may find that reducing the zinc oxide will give satisfactory physicals without affecting heat aging.

Type W Neoprene Water Resistant Compound

An evaluation of dispersed red lead for a safe processing, low mechanical water absorption neoprene compound was made. The goal was to demonstrate that less red lead properly dispersed would afford the same protection as the standard 20 parts of dry red lead. This could mean a significant reduction in specific gravity of the compound. Compounds 3 and 6 with 20 parts of lead, shown in Table VI, have a specific gravity 1.574, whereas compounds 2 and 5 with 15 parts of lead have a specific gravity of 1.545.

The original physical properties are given in Table VII and are summed up in Figures 15 and 16. A tighter cure is obtained with 15 parts of red lead dispersed than with 20 parts of dry. Oven aging performance is also given in Table VII and Figure 17 indicates that 15 parts of red lead dispersed gives adequate performance.

Mechanical water absorption data is given in Table VIII for 7, 14 and 28 days. It is apparent that the dispersed red lead is more effective and gives lower values at 15 parts than the dry red lead provides at 20 parts.

TABLE VI—FORMULAS FOR SAFE PROCESSING WATER-RESISTANT NEOPRENE COMPOUNDS WITH DRY AND DISPERSED RED LEAD

Compound No.	1	2	3	4	5	6
Neoprene Type W	100.00	100.00	100.00	100.00	100.00	100.00
Neozone A	2.00	2.00	2.00	2.00	2.00	2.00
Heliozone	3.00	3.00	3.00	3.00	3.00	3.00
MAF Carbon Black	20.00	20.00	20.00	20.00	20.00	20.00
SRF Carbon Black	20.00	20.00	20.00	20.00	20.00	20.00
Hard Clay	50.00	50.00	50.00	50.00	50.00	50.00
Light Process Oil	12.00	12.00	12.00	10.90	10.30	9.80
Petrolatum	2.00	2.00	2.00	2.00	2.00	2.00
Red Lead	10.00	15.00	20.00	—	—	—
Red Lead Prespersion	—	—	—	11.10	16.70	22.20
Thionex	1.00	1.00	1.00	1.00	1.00	1.00
Sulfur	0.75	0.75	0.75	0.75	0.75	0.75

TABLE VII—ORIGINAL AND OVEN-AGED PROPERTIES OF A SAFE PROCESSING WATER-RESISTANT NEOPRENE COMPOUND WITH DRY AND DISPERSED RED LEAD

Compound No.	1	2	3	4	5	6
ORIGINAL PROPERTIES AT 70° F.						
Tensile Strength, psi						
10 Min.	2425	2505	2530	2560	2550	2545
20 Min.	2515	2580	2540	2585	2580	2620
30 Min.	2500	2550	2520	2540	2640	2640
Modulus at 200%, psi						
10 Min.	1140	1170	1190	1195	1200	1230
20 Min.	1250	1210	1270	1260	1320	1350
30 Min.	1290	1275	1310	1270	1365	1390
Elongation at Break, %						
10 Min.	515	520	525	540	510	515
20 Min.	480	490	465	495	465	470
30 Min.	450	440	455	445	445	450
Tensile Prod. x 10³						
10 Min.	125	130	133	128	130	131
20 Min.	120	126	118	128	120	123
30 Min.	113	112	114	113	117	119
PROPERTIES AFTER OVEN AGING 7 DAYS AT 70°C.						
Tensile Strength, psi						
10 Min.	2540	2440	2380	2445	2515	2485
20 Min.	2535	2300	2255	2495	2380	2380
30 Min.	2405	2380	2395	2435	2470	2350
Modulus at 200%, psi						
10 Min.	1435	1580	1410	1610	1520	1510
20 Min.	1530	1540	1530	1595	1565	1410
30 Min.	1435	1535	1435	1505	1470	1520
Elongation at Break, %						
10 Min.	390	355	365	370	365	360
20 Min.	365	325	340	355	315	360
30 Min.	370	335	350	300	370	350

Automation

Automation is entering the rubber industry. When the electronic brain calls for the introduction of the accelerators and activators and retarders, it would be a simple matter for one positive displacement pump with an adjustable stroke to meter in the exact amount of predispersed material quickly. The various ingredients mixed in advance in the correct proportions have a better chance of being distributed through the rubber in the selected ratio next to one another so that they can interact than if each dry powder were metered out by a separate automatic weighing machine. Less equipment would be needed, and the time required for metering several bulky powders would certainly be reduced by

using one concentrated dispersion, and the accuracy would be greater.

Conclusion

The data indicate that dispersing sulfur permits the reduction of the amount used without sacrificing state of cure. With this reduction, heat aging is significantly improved. Even at the higher levels, heat aging is better if the sulfur is dispersed. There is some indication that the use of dispersions may give the compounder more latitude in time of cure which would reduce the trouble of over-curing by making vulcanization time less critical.

In general, there is evidence that pre-dispersing active rubber compounding chemicals changes their characteristics. It makes them more active or efficient but nevertheless safer to use. With the trend towards faster production, pre-dispersion offers better control in the factory. We cannot change the wettability of the base polymers to make up for shorter milling cycle, but we can employ dispersions to compensate. Good dispersion with low heat history contributes to better, faster processing and longer bin storage life. Chemicals usually dispersed with difficulty can now be introduced at the very end of the milling cycle with the assurance that they will be uniformly and rapidly incorporated.

The additional cost of the dispersion may be balanced by better quality, saving of masterbatching, saving in milling time and less scrap. When automation arrives, combination accelerations pre-dispersed will be essential.

TABLE VIII—MECHANICAL WATER ABSORPTION OF SAFE PROCESSING WATER-RESISTANT NEOPRENE COMPOUNDS WITH DRY AND DISPERSED RED LEAD

Compound No.	1	2	3	4	5	6
Time in 70° C. water	Water increase, mg./sq. in.					
7 days	33.2	25.9	23.1	31.7	21.3	20.8
14 days	40.6	29.8	27.2	38.6	26.1	23.8
28 days	58.9	39.1	35.1	53.3	36.2	32.4

ACKNOWLEDGMENT

The author wishes to thank members of the staffs of the following companies for supplementary technical data furnished to help complete this report: General Electric Co., Bridgeport, Conn.; R. T. Vanderbilt Co., Norwalk, Conn.; and Lukens Laboratory, Newton, Mass.

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(1) Schwartz, Emil, "Butyl Rubber in Wire and Cable Extrusions," *Rubber Age*, Vol. 79, pp. 630-31 (1956).

(2) Method 441.1, Section IV, Part 5, "Federal Standard Stock Catalog," TT-P-141b.

(3) ASTM Procedure D-15-54 (Modification: Accelerators and sulfur were added at 150° F.).

Coming Next Month...

Effect of Gamma Radiation on Miscellaneous Elastomers and Rubberlike Plastics Materials—By Robert Harrington, Hanford Laboratories Operation, General Electric Co., Richland, Wash.

Part IV of a series on "Elastomers for Use in Radiation Fields" concerns the effects of ionizing radiation on butyl rubber, natural rubber, vinylpyridine rubber and a polysulfide elastomer, and on polyethylene and vinyl chloride, and supplemental elastomers.

A Practical Method for Examining Carbon Black Dispersion in Rubber—By I. Drogin, United Carbon Co., Charleston, West Virginia

Description of a simple, practical and rapid method of examining the dispersion of carbon black in rubber which offers the added advantage of employing inexpensive, readily available equipment.

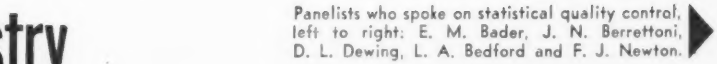
Chemically Loaded Molecular Sieves—A New Aid to Rubber Compounding.

Describing a manner in which premature curing of rubber compounds can be avoided and relatively slow curing compounds speeded up through the use of a new product with unique temperature-sensitive properties.

Statistical Quality Control in the Rubber Industry—Questions and Answers at a Symposium.

A complete transcript of the question-and-answer period which followed a symposium on quality control held by the Akron Rubber Group.

Statistical Quality Control in the Rubber Industry



Panelists who spoke on statistical quality control, left to right: E. M. Bader, J. N. Berrettoni, D. L. Dewing, L. A. Bedford and F. J. Newton.

SQC has become a basic factor in rubber manufacture; herewith are papers on the subject given before the Akron Rubber Group

A SYMPOSIUM on "Statistical Quality Control in the Rubber Industry" was presented to the Akron Rubber Group when it met on January 24, 1958. E. M. Bader, B. F. Goodrich Aviation Products Co., Akron, Ohio, began the discussion with comments on *Introduction to Statistical Quality Control in the Rubber Industry*, and introduced the other four panelists. The speakers and their subjects were: Dr. J. N. Berrettoni, Western Reserve University, Cleveland, Ohio, *Organizing for Quality Control;* Donald L. Dewing, General Tire & Rubber Co., Akron, Ohio, *Statistical Quality Control as Applied to Rubber Products;* L. A. Bedford, Goodyear Tire & Rubber Co., Akron, Ohio, *Statistical Quality Control in Chemical Processes*, and F. J. Newton, Ford Motor Co., Detroit, Mich., *Quality Control Applied to Consumer Requirements*. The papers given by the panelists are presented in full herewith. A transcript of the questions and answers which followed the presentation of the papers will be published in the June issue of RUBBER AGE.

Introduction to Statistical Quality Control in the Rubber Industry

By E. M. BADER

Manager of Quality Control, B. F. Goodrich Aviation Products, Akron, Ohio

THE quality control function is one of the youngest elements of manufacturing operations to be isolated and recognized by management in industry. It is younger still in the rubber industry. Therefore, I think it will prevent some confusion if I partially define two terms—quality and statistical quality control.

The word quality has several meanings. Often it is used to indicate the differences between products due to differences in their basic design standards. Using this definition the modern American automobile is considered to be a better quality product than most of the lightweight European automobiles. In the field of quality control, however, the word quality is used interchangeably with the word uniformity. Good quality products then are those that consistently meet the requirements of a standard or specification.

Statistical quality control is very similar to many other quality control systems. The objective of any quality control system is to attain uniformity in products or product components. To achieve this uniformity at any point in a manufacturing system, four tools are needed: (1) A sound specification or standard, (2) A method of measuring the product or component, (3) Personnel to perform the measurement work, and (4) A sampling system and a method of interpreting sample data.

If any of these tools is missing the control system will not achieve uniformity. The only difference between statistical quality control and any of the other control systems is in the fourth tool. Statistical quality control is the only system that has provided industry with sound scientific methods for determining sample sizes and interpreting sample data. These scientific methods are the newest additions to the quality control field and their publicity has dwarfed the importance of the other three tools. However, statistical quality control cannot achieve uniformity with statistical methods alone and it is impossible to discuss this subject without spending some time on the non-statistical phases of quality control.

Because of the versatility of these statistical methods and the complexity of the rubber industry, the panel will not be able to travel very far in the discussion of quality control during the time that has been provided. However, because this subject is so new, the rubber industry has experienced a chronic case of "growing pains". Almost all of the rubber companies have been trying to find the "right" way to fit the quality control function into their existing organizations. Therefore, the first topic to be discussed is "Organizing for Quality Control".

The second and third topics will deal with some of the applications to the manufacture of rubber products and the control of chemical processes. Finally, the last topic to be discussed will be quality control applied to customer requirements. This last topic, of course, deals with one of the prime motives for having a quality control system.

Organizing for Quality Control

By J. N. BERRETTONI

Chairman, Department of Statistics, Western Reserve University, Cleveland, Ohio

THERE are three fundamental steps in organizing for quality control. The first is to assign management authority and status to the quality control function. A company's success depends not only on service and price but also on quality. Service and price have been recognized for some time in the respective positions of Vice-President of Production and Vice-President of Sales or equivalent titles. Now is the time to extend recognition and authority to quality control by establishing a similar position and title of Vice-President of Quality.

The second step is to determine the different functions to be covered by statistical quality control. This step defines duties and responsibilities. The functions are located in different departments of a company and, generally speaking, these departments are: Engineering, Tools and Machines, Purchasing, Production, Gauges and Inspection, and Sales.

In engineering, the tolerances of the blueprint are the quality guides and standards. The precision of tools and machines, the mechanical means of production, is directly dependent upon the quality dictates of the product. The purchasing function is interlaced with quality standards and demands of the finished product. Production manufactures parts in conformance to engineering blueprints and very often assembles all parts, both manufactured and purchased, into a finished article of given quality. Gauging and inspection are necessary to measure and record quality. And sales finally sells the highly advertised quality product.

The quality control functions, in detail, are as follows:

ENGINEERING

(1) Statistical appraisal of print tolerance; realistic versus reference dimensions; costly versus practical tolerances, etc.

(2) Statistical formulations of the interrelationship of tolerances; the differential or statistical methods of accumulated tolerances.

(3) Statistical procedures and techniques for determining production tolerances from experimental runs.

(4) Setting up efficient experimental designs to determine effects of different variables.

(5) Statistical evaluation of testing variation for standardization purposes.

TOOLS AND MACHINES

(1) Machine and process capability studies.

(2) Correlation of tool dimensions with production variation, tool life and tool replacement.

PURCHASING

(1) Determine statistical sampling plans for disposition of incoming goods.

(2) Survey jobbers and vendors to determine their quality assurance factor so that acceptable quality will be delivered.

(3) Set up a vendor and jobber quality rating and certification procedure.

PRODUCTION

(1) Install a comprehensive system of in-process statistical quality control. Appropriate and efficient statistical techniques must be used for defect prevention.

(2) Install a statistical sampling procedure for certification of outgoing quality.

(3) Analyze rework and scrap in terms of: (a) Departmental segregation: Which is responsible—engineering, metallurgy, plating, packing and shipping, clerical errors, etc.; (b) Departmental reasons: What are the causes—non-realistic tolerances, operator, machine capability, manufacturing methods, inspection, missed operation, etc.

(4) Quality control of blueprints—review prints for quality appraisal before issuance and before a part or product is made.

(5) Corrective action appraisals and evaluations.

GAUGING

(1) Statistical evaluation of gauges in terms of gauge efficiency and error. Sensitive gauges with too small an error are impractical in production, and non-sensitive gauges with large error are useless. Efficient and useful gauging methods can be determined by statistical analysis.

(2) Determine whether attribute or variable gauging should be used.

INSPECTION

(1) Supply sampling plans, control charts, etc., and determine the frequency of inspection checks.

(2) Evaluate inspection efficiency.

(3) Train inspectors in elementary principles of quality control.

SALES

(1) Analyze and evaluate quality requirements of the customer in terms of AQL's, classisfication of characteristics, customers' sampling plans, etc.

(2) Determine the "acceptability" of the customers' quality requirement in terms of production capability.

(3) Study in detail customers' complaints and returns. Again, these should be in classifications of departments and departmental reasons.

(4) Contact and visit customers (with the clearance of the Sales Department) to obtain further information and understanding of customer quality requirements, sampling plans, methods of inspection, defect evaluation, etc.

(5) Corrective action appraisals and evaluations.

The third step in organizing for quality control is to hire competent personnel with whom an efficient organization can be built around the quality control functions. In this respect the quality control manager can be an engineer or a chemist or a metallurgist who has had no formal training in statistics. However, it is to be emphasized that without this training he must hire a competent statistician because all of the above quality functions demand a knowledge of statistics. Further, others in the department of quality control should have a basic background of statistics because of demands for analysis and realistic and significant conclusions.

Who is responsible for quality? In organizing for quality control this ever present question must be answered. Immediately one might say that quality responsibility lies in the quality control department. However, not all of the responsibility is in the quality control department because quality control cannot change engineering tolerances or tool dimensions, or purchase raw material, or inspect the product or manufacture the parts.

As we have noted, quality control determines reasons for rejections, studies relationships, devises charts for defect prevention, evaluates customers' quality demands in terms of the producers' capabilities, etc. But more important than anything else, quality control determines to what extent poor quality in terms of production rework and scrap and customers' complaints and returns is due to Engineering, Tools and Machines, Purchasing, Production, Gauges, Inspection and Sales. From this point on it is up to management to institute corrective action.

Why create a Quality Control Department when the quality functions fall under different department headings? The answer to this important question is that those departments have been created to take care of other duties and responsibilities and therefore, the quality functions actually do not "belong" to the departments. In actuality, the departmentalization means specialization and the need for specialization in quality is very urgent, regardless of where the functions fall.

Statistical Quality Control as Applied to Rubber Products

By DONALD L. DEWING

Director of Quality Control, General Tire & Rubber Co., Akron, Ohio

IN order to discuss the subject of statistical quality control, I would like to explain what we mean by certain terms such as quality, quality control and statistical quality control, as these terms do not necessarily have the same meaning to different people.

Quality is the conformance of a product to three criteria: performance of intended function, customer satisfaction and competitive cost. For certain products, we may wish to emphasize low cost, possibly at the expense of performance or customer satisfaction. In other products, we may wish to emphasize performance or customer satisfaction. In any event, the quality of a product may be numerically stated in terms of an outgoing quality level based on an analysis of these three criteria.

Quality control is the act of assuring that products

meet their established quality levels. There are six major areas of quality control, as follows: order control, design control, incoming material control, in-process control, outgoing product control and field performance.

Order control consists of assuring that the incoming order clearly states the quality requirements of a product and that these requirements are compatible with the capabilities of the plant.

Design control assures that accurate definitive design, drawings and specification are available and that there has been sufficient experimental testing to prove that the design will meet quality requirements prior to the introduction of the design into manufacturing.

Incoming material control assures that adequate material specifications are available and that no materials are accepted for use in the plant that do not meet these specifications.

In-process control assures that adequate process specifications and methods are available which, if followed, will result in products that meet quality requirements at the lowest possible cost.

Outgoing product control consists of the final inspection and testing of a product to ascertain that only products meeting established quality levels are being shipped to customers.

Field performance is the measurement of the actual product performance in the field, the degree of customer satisfaction, and a comparison with competitive products.

Thus, a thorough quality control program must start with the receipt of an order in the plant, continue through design, production, inspection and shipping and end only with the satisfactory consumption or use of the product by the customer. The scope of the program is such that it becomes readily apparent that quality control is not the private domain of any one department or person but is "everybody's business". The combined efforts and cooperation of every department in the plant is required. Because of the large number of departments involved and the large number of things that have to be right to achieve product quality, it becomes apparent also that there must be a coordinating person or group, and in most industries this function has been assigned to the modern Quality Control Department.

Statistical quality control is simply the application of statistical techniques to the quality control program. The statistical techniques used in quality control are not different from those used in other industrial activities. The statistical techniques used in the quality control of rubber products are the same as those used in the quality control of any other product.

Classifications of Statistical Techniques

Statistical techniques may be divided into three general categories. The first we might call data processing, which includes the collection and compilation of quality data, making computations as required, and finally the issuance of records, charts and reports in the most convenient form for use.

The second category we might call data analysis or data evaluation. This phase consists of using existing data to draw conclusions about the quality of a product or process. In statistical terms, this is called statistical inference. Probably the most common example of statistical inference is sampling wherein from the analysis of the inspection data of a sample, a statement is made relative to the quality of the lot from which the sample is drawn. The principal value of statistical inference lies in the fact that experimental error is considered and the risk of making false conclusions can be reduced to any specified value desired.

The third category is the design and analysis of experiments. This involves the use of statistical methods instead of the trial and error (one variable at a time) approach in solving quality problems. The value of statistically designed experiments lies in the fact that all of of the important variables which might cause the product or process problem are considered simultaneously, thus minimizing the amount of experimental effort required.

Effects of Combinations of Variables

In addition to determining the effect of each variable, the effect of various combinations of the variables can be determined. The best technical knowledge available is used to determine the variable to be studied. If this technical judgement is correct, the source or sources of the problem may be quickly isolated and the variables having little or no effect can be discarded. If the technical judgement is wrong and the most important variables are not selected, this will be pointed out by the first experiment and additional variables may be studied until the problem is solved. Thus, the designed experiment is a completely objective device, making use of all technical knowledge and advice but not depending solely upon it.

The designed experiment is not just a fancy way of solving a problem that could be solved by other means. For complex problems, where there is a large number of variables and a large amount of experimental error, statistical methods offer the only satisfactory means of solution. There is no alternative method.

These statistical techniques, if properly applied can be very useful in reducing quality losses and also in reducing the cost of inspection and testing. However, there are certain precautions that must be taken in installing a statistical quality control program:

(1) Statistics is only one of the tools available to quality control and should be used only when it is the most applicable and economic tool.

(2) Statistical techniques depend on complete and accurate data and should not be used whenever there is a doubt as to the validity of the data.

(3) Accurate data can be obtained only by a thorough quality control program with accurate quality standards, inspection and test methods, proper control of tools and gauges, trained inspectors and test technicians, adequate data systems, etc. In other words, you cannot have a statistical quality control program until you have a good quality control program in all other respects.

(4) Statistical techniques should be applied only by presons properly trained in statistical methods as false conclusions can be obtained by the improper application of statistical techniques.

(5) The full benefit of a statistical quality control program can be obtained only by the full cooperation or team work of the several departments involved in the process or product quality problems.

Statistical techniques can be profitably used in the

several quality control areas. For incoming orders, statistical methods are used to determine process capabilities. This tells what the process is capable of doing under optimum conditions. The process capabilities should be compared with quality requirements and if the two are not compatible, corrective action should be taken before and not after the item has gone into production.

In design control, the designed experiment is useful in evaluating alternate designs, in establishing test programs for the evaluation of the design versus the quality requirements, and for establishing realistic design tolerances.

For incoming materials, designed experiments are useful in determining the effect of raw material properties on process and product requirements and for the establishment of accurate and reproducible test methods. Sampling plans are used for the inspection of items other than raw materials. Variable control charts are often useful in maintaining records on important raw material properties and for initiating corrective action with the vendor.

In-process control makes use of the designed experiment to optimize processing conditions and to solve the more complex quality problems. X and R control charts are used to control machines and processes wherever the amount of scrap or rework justifies. Per cent defective charts on the more troublesome products are desirable in order that corrective action may be taken at the proper time. Continuous sampling plans work well on process and product conveyors if the per cent defective is low and the process under reasonable control. Attribute sampling plans such as Mil-STD 105 can be used to accept lots of material in-process. Variable control charts are useful for maintaining records of laboratory tests.

Outgoing product control uses lot or continuous attribute sampling plans for the acceptance of outgoing product. Measurable variables such as weight, balance and hardness can be accepted on the basis of modified control charts. Designed experiments are used to establish accurate and reproducible test methods and for establishing production test programs.

In field performance, adjustment and customer complaint data is processed and analyzed in order to determine the correlation of adjustments with in-plant defects and is examined so as to determine cause and effect relationships.

Summary

In summary, I would like to state the rubber industry is a very fertile field for the use of statistical methods in quality control because of the large number of raw material, process and product variables and also the large amount of unknowns. The relationship between the raw material variables and process or product quality have not been established for many raw materials. The relationship between in-process specifications and process and product quality has not been established. The relationship between in-plant or laboratory test methods and the performance of the product in the field has not been established.

It is believed that the chief benefit of statistical methods would result from the use of the designed experiment and the replacement of arbitrarily established specifications and test methods with scientifically determined facts. However, it is believed that the proper use of the statistical techniques indicated above to all of the areas of quality control will result in better product quality from the standpoint of performance, customer satisfaction, and, particulary, low cost.

Statistical Quality Control in Chemical Processes

By L. A. BEDFORD

Manager of Quality Control, Chemical Operations, Goodyear Tire & Rubber Co., Akron, Ohio

MODERN concepts of quality control are being applied in the chemical process industries with remarkable success. These concepts (*1*) include: (1) The stressing of defect prevention rather than sorting good lots from bad ones; (2) A scientific approach to quality with the use of statistical methods; (3) The idea of "staff" assistance to provide the time and skills to collect and analyze data, and (4) An organizational set-up to coordinate quality efforts and programs.

Dr. W. A. Shewhart, starting in 1925, laid the groundwork for statistical quality control in his work at the Bell Telephone Laboratories. Since that time, the control techniques developed by Dr. Shewhart, together with newer concepts and methods, have found wide application in the mechanical industries. It was not until ten or fifteen years ago that the ideas began to be used to any marked degree in the chemical process industries.

Every industry—mechanical and chemical—has quality problems. Where numbers can be applied to these problems, statistical quality control can be used to advantage. Today, all large chemical companies are using SQC to aid in achieving the required quality level, required uniformity, reduced scrap and rework, and lower product costs.

There are three areas of control in the manufacturing of chemicals: raw materials, in-process, and finished product. For our discussion of SQC let us consider process control in a going chemical plant. The terms process control, quality control, and statistical quality control, will be used interchangeably.

The primary problem is knowing when the process is at the proper quality level and when abnormal influences are creeping in which will cause poor quality. Most chemical companies have standard operating procedures which specify the operating conditions and intermediate sample tests to be run to control the process

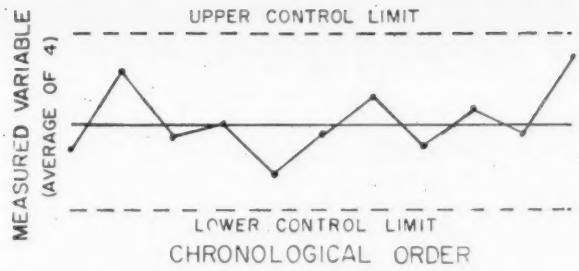


FIG. 1—"Average" control chart for maintaining a manufacturing process at the proper level.

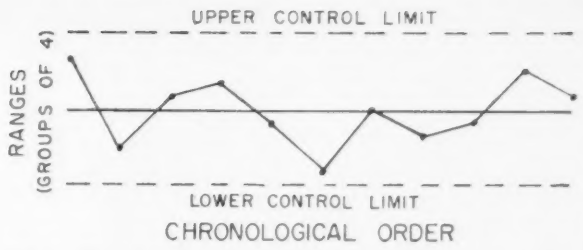


FIG. 2—"Range" control chart for maintaining uniformity in a manufacturing process.

and produce the desired quality product. The operating data are recorded on log sheets at the operation or in the control laboratory. These log sheets in the past have been used for record purposes only and were very rarely analyzed except when trouble was already a reality. By plotting the operating data on control charts the observer can more easily keep the process in bounds *(3)*.

A combination of Shewhart's "average" and "range" control charts *(2)* provides the most sensitive means of maintaining control. Figures 1 and 2 represent such charts. The average and range of four consecutive test results or conditions are plotted chronologically. The upper and lower control limits are calculated statistically *(4)*. As long as the points remain within the control limits and move randomly about the average line, the process is in control.

The control limits are not based on specification limits. The area between the dotted lines represents the normal inherent variation in the condition or characteristic which is being measured. It represents the area of chance variation—the result of many small causes usually too numerous to economically investigate—the variation present when the process is going smoothly.

Points outside these limits signal that an abnormal condition, an assignable cause, has entered the process. An investigation is in order to correct the cause, or loss of quality in the finished product will result. These assignable causes can be due to workmanship, instruments going out of adjustment, errors in test procedures, malfunctioning of equipment, and similar mishaps. By the use of control charts trouble is spotted immediately. It is important to take action when the process is out of control, but it is equally important not to make adjustments when the process is in control.

The relation of process variables to finished product characteristics can be observed by combining all the control charts into a master chart. All the individual charts and their relationships can be seen at a glance. Such a chart is diagrammatically shown in Figure 3, which is over-simplified but illustrates the point.

With the control charts for process variables and product characteristics plotted one over the other, it is easy to determine at time "A" that the low purity, shown on the upper chart, was probably due to poor filtration and high drier temperatures. The reaction by-products were not being removed properly because of low filtration vacuum. Also degradation was taking place in the drier due to abnormally high temperatures. With this knowledge established, the next time the filter vacuum or drier temperature goes out of control, it can be predicted that the purity will be low before the product is in its final form and tested. Corrective action can be taken immediately, saving several hours production of low grade product.

At time "B" the vacuum on the filter had been corrected and had overcome the drier effect. However, it was impossible to maintain this high vacuum. At time "C" the purity of the product was higher than usual. The master control chart indicated this was due to high reaction temperatures. On further study this proved to be true. The higher reaction temperatures also increased the yields slightly so operating procedures were changed to maintain this condition.

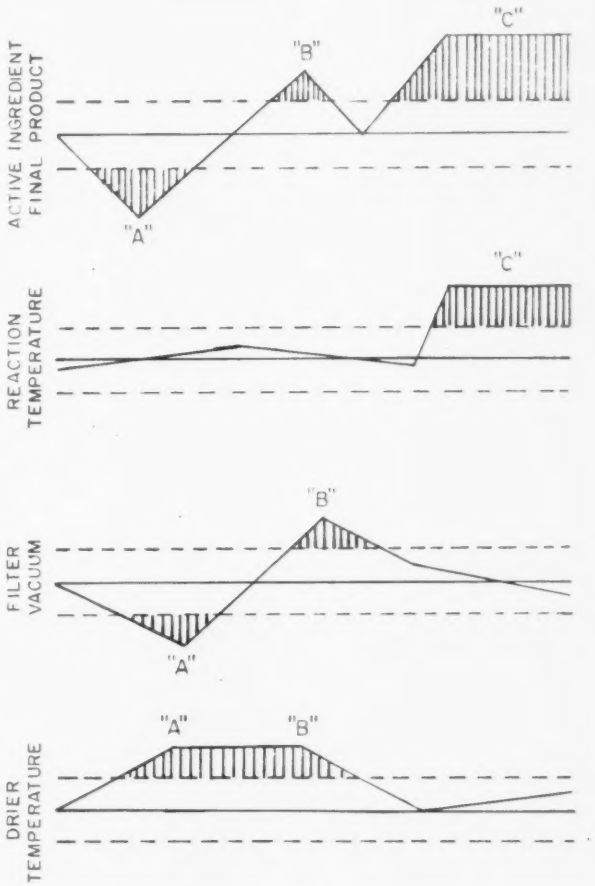


FIG. 3—Master chart of relation of process variables to finished product characteristics.

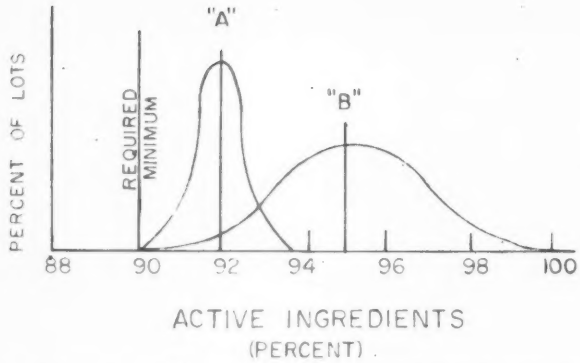


FIG. 4—Relation of lot to lot purity and average level of purity at which a process must be operated to meet a 90 per cent minimum purity requirement.

In going from pure log sheet control to the use of quality control charts it is not unusual to improve the quality uniformity of products by fifty per cent or more. This uniformity gains more customers and at the same time can be important in cost reduction. As illustrated in Figure 4, if lot to lot purity of "B" varies plus or minus 5 per cent, it is necessary to operate the process at an average level of 95 per cent to be sure that almost all of the lots will meet the 90 per cent minimum purity requirement. As shown by "A" the process needs only to average 92 per cent purity to meet the 90 per cent minimum requirement if the variation lot to lot is reduced to plus or minus 2 per cent. This represents a savings of 3 per cent (95 to 92) in the costly active ingredient by improving uniformity.

Control charts are the simplest, the most frequently used, and the most useful technique in chemical process control. Other more complicated but important statistical methods include correlation analysis, significance tests, and analysis of variance *(5)*. Bennett and Franklin cover these methods with special emphasis on the chemical processes in their book *(6)*.

Published reports with long columns of figures, unfamiliar nomenclature, and fancy symbols are not enough to obtain better control. Neither do control charts work in a vacuum. Someone must take action. A satisfactory method of obtaining action is through a plant team or committee consisting of the production foreman, quality control engineer, and a technical representative. This group meeting once a week, with their combined knowledge, has proven effective in getting action—improved quality and lower costs.

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Quality Control Applied to Consumer Requirements

By F. J. NEWTON

Manager, Standards and Methods Department, Quality Control Office, Ford Motor Co., Detroit, Mich.

WE in quality control are concerned with the quality of the Ford Motor Company's products. This concern starts with the receipt of the basic raw materials, extends through manufacture and assembly, and continues through the service life of the completed vehicles. However, for the purposes of this meeting, we will limit the discussion to activity in the area of incoming materials and parts.

In order that uniformity of receiving inspection activities in the various operating divisions of the company be maintained, procedures are established by the quality control office in central staff. These procedures are constantly being reviewed for refinements and improvements to assure the best possible control.

Upon release of a new design or material by engineering for production, machinery is immediately set into motion by the using division to assure that the supplier is capable of producing the part or material in accordance with the engineering release. This machinery is as follows:

First, if the using division decides that a gauge is required to properly evaluate the part, a gauge is designed, and the supplier or suppliers are provided with duplicate gauges. All of these gauges are checked at one central location, in order to assure that the gauges used by both the suppliers and the part users are as nearly identical as possible. In some cases, special test requirements are spelled out on the blueprint, and arrangements are made to secure test stands or other testing equipment in order to evaluate performance against requirements.

The initial sample program, as spelled out in our procedures, calls for the submission by the supplier of parts or materials off production tooling without any handwork. These parts (and we will use the word part to mean part or material hereafter to save repeating) are subjected to a complete layout and laboratory check in order to determine if the part is made to the specifications on the blueprint. If these samples are approved in layout, they are then checked functionally. In this check, parts are assembled to the mating parts and functioned. Engineering approval is also required in some cases.

Once these approvals have been granted, the supplier is

authorized to make one production shipment to the control point. This shipment of parts must be made off production tools on a production set-up. Samples from this shipment go through the same procedure as initial samples. This double-check is designed to check on the capability of the supplier to produce parts on a production basis.

Inspection Sheet for Routine Shipments

A complete analysis of the part blueprint is made by a quality engineer who determines the dimensions or characteristics which should be checked in order to rapidly determine operational or functional performance of a satisfactory quality part. These characteristics are detailed on an inspection operation sheet and each characteristic is classified as to its importance (safety, major, minor, or incidental). An acceptable quality level is established on each of these characteristics by our statistical quality control analysts. Regular routine shipments are inspected in accordance with these sheets.

Control points are set up by multi-plant divisions at certain plants, and at these points, facilities and manpower are provided to check incoming shipments by layout, laboratory, and receiving inspection. Shipments billed to other plants are periodically diverted to control points for inspection. Receiving inspection is performed by semi-skilled workmen, in accordance with the above-mentioned inspection operation sheets. Normal shipment sampling frequencies are established by the analysts on the basis of the type of characteristics defined by the engineers noted above.

For example, a part of the steering system, which is a safety item, is sampled on a frequency of one, which means each shipment is sample inspected; and, of course, a safety characteristic has an A.Q.L. of "O", which means any defectives in the sample rejects the shipment. The sample size is determined by the shipment size, in accordance with an acceptance sampling table derived from joint Army-Navy Standard 105. It should be noted that a double sample plan is used.

In addition to receiving inspection, a frequency is established for layout and laboratory inspection. These, of course are on a much less frequent basis. If a shipment is rejected for any reason, the next shipment is inspected regardless of the frequencies established. After the rejection of a shipment, purchasing is notified by receiving a copy of the inspector's report. A copy of this report is also sent direct to the supplier.

What do we do with shipments that have been rejected? By procedure, disposition of rejected shipments is the responsibility of production control. If production control determines that the stock is not needed for production, then the supplier is asked what he wants done with the material. Depending upon his answer, the stock is scrapped locally, or returned to him for salvage. If it is determined that the stock situation requires use of the shipment, the material is sorted and the salvable portion is repaired. The cost of sorting and repair is charged back to the supplier. This, of course, is a very brief summary of the steps taken on rejected shipments.

Records are maintained by quality control on each part and each supplier. These records become the basis for compiling the supplier's performance report, or quality trend charts. Through the use of data processing equipment, it is possible at any time to accurately determine the ability of a supplier to produce quality parts. These supporting records and reports become the basis for action by both quality control and purchasing in the following ways:

(a) Continued poor performance on the part of any supplier is brought to his attention through the medium of joint meetings.

(b) Serious or continuous deviations from blueprints or performance specification result in issuance of stop orders. Once a supplier has been placed on stop, he cannot resume normal shipments until a satisfactory shipment has been made to the control point.

(c) Parts which consistently evidence poor quality are examined to determine whether or not a change should be made to make the part more easily manufactured on a commercial basis, or whether the tooling is inadequate to produce quality merchandise.

(d) Suppliers who show a consistently poor quality performance are warned that unless corrective action is taken, they may not be considered in the placement of new business.

Summary

We have pointed out the precautions taken by the Ford Motor Co. to insure the use of parts of satisfactory quality. We have also told you of control of routine shipments, initial samples, and some of the action taken with suppliers of unsatisfactory material. As you can well imagine, most of these actions are much more effective in dealing with suppliers where multiple sourcing is used. However, in some cases, regardless of the effect on the production schedule, corrective action must be taken and substandard parts must not be used.

Now, what does a consumer such as Ford Motor Co. expect from a supplier? First, we expect a supplier to know his business. Many times, a supplier is called in during the engineering phase in order that his experience may be drawn upon. Many parts are made by firms with highly specialized know-how, such as people in the rubber business. You can be sure that we cannot know all the details and problems associated with the processing of rubber items.

Second, when a part is rejected, we want action to prevent a recurrence of the same problem. We can understand that process capability, and even momentary lapses in the quality control set-up, will permit the occasional shipment of bad material. In fact, as pointed out previously, our sample inspection system and the A.Q.L.'s established allow such deviations. However, although we may sympathize with your problems, we are not inclined to let them become a factor in our evaluation of your performance or parts.

Third, the blueprint, or material specification, and performance requirements are the "bible". Deviations, unless authorized properly, are a continual source of irritation to both Ford Quality Control and the supplier. Therefore, when a supplier has a rejection entered against him, he should find out why, then correct the condition as quickly as possible.

The record of rubber product suppliers is good, which is an indication that they know not only how to make good parts, but how to control their processes to continuously ship good parts.

Editorials..

Another Soviet Threat

Synthetic Capacity of the Soviet Bloc Poses a Threat to North American Manufacturers of Synthetic Rubber

► A rather interesting point relative to Soviet expansionist policies was raised by A. J. Pickett, editor of *Rubber and Plastics Age (London)*, in his address before the recent meeting of the Commercial Chemical Development Association in New York City. Mr. Pickett stated that Western Europe will have the capacity to produce 217,000 tons of synthetic rubber by the end of 1958. Of this sum, 153,000 tons will be general purpose rubber, 25,000 tons butyl rubber and polyisobutylene, 20,000 tons chloroprene rubber, 10,200 tons nitrile rubber, and 9,000 tons styrene resins and latices.

Mr. Pickett is of the opinion that by the end of 1960 Western Europe will have the capacity to produce 371,000 tons of synthetic rubber a year. Consumption of synthetic rubber in that year, he believes, may well rise over 400,000 tons and by 1965 over 600,000 tons may be consumed in Western Europe. Although Western Europe's synthetic capacity may be able to take care of the demand by 1965, it will still need considerable quantities of imported synthetic rubber in the meantime. The free countries of the world, declared Mr. Pickett, will have to use more synthetic rubber if they are to compete successfully in the trade war that the Russians are threatening to launch.

It is expected that Western Europe will consume 873,000 tons of new rubber in 1960. If Western Europe operates its synthetic plants at full capacity and consumes the total production, 42.5 per cent of all the new rubber consumed will be synthetic. If we assume a possibility of a greater synthetic preference ratio, the question of imports enters the picture. Most projections made today of potential synthetic rubber consumption in Western Europe through 1960 include an import factor of about 250,000 tons. If we add the 250,000 tons to the 371,000 tons which Western Europe will be capable of producing at that time, we have a total of 621,000 tons, or 71 per cent of the new rubber estimated to be consumed.

While the possibility exists, as Mr. Pickett suggests, that Western Europe may show a synthetic preference ratio of 71 per cent by 1960, such a reversal of form does not seem probable. What is likely, we believe, is that Western Europe will be consuming rubber in a 50-50 pattern within the next few years. For this reason, many observers have been urging American synthetic rubber producers to lend impetus to the consumption of synthetic rubber abroad. In this way, the American producer will assure himself of a continuing and growing market.

It then follows that the amount of American

synthetic rubber consumed in Western Europe during the next ten years will depend on the job that American producers do in providing an assured supply of synthetic at prices competitive with natural. Now we come to the nub of the problem. If the North American producer of synthetic rubber does not encourage and meet the demands of the Western European consumer, Russia will.

Many of us are given to overlook the ability of the Soviet bloc nations to produce large quantities of synthetic rubber. According to Mr. Pickett, the Soviet Union and her satellites have the capacity to produce 462,000 tons of synthetic rubber in 1958, and this may rise to 650,000 tons by 1960. Out of a total of twenty plants in Eastern Europe, there are known to be four plants producing chloroprene rubber, and there is a considerable output of nitrile rubber. The Russians are also producing a synthetic polyisoprene which has been extensively tested in tires. All this is indicative of the stress which Russia is placing on synthetic rubber development and production.

The United States and the Soviet bloc are said to be running about neck and neck in the synthetic consumption preference ratio. That is, about 62 per cent of the rubber consumed in the United States and in the Soviet bloc is synthetic. By 1965, synthetic consumption in both may exceed 70 per cent of the total. Mr. Pickett's figures indicate that, as of now, East Germany has the capacity to produce some 76,000 tons of synthetic rubber a year, and this will rise to about 100,000 tons by 1960. Poland now has the wherewithal to produce some 36,000 tons, and by 1960 will be able to produce about 50,000, while Russia herself is said to have the capacity to turn out 350,000 tons a year and by 1960 will have the ability to produce 450,000 tons. By the end of 1960, Rumania will enter the picture with a 50,000 ton plant. Russia, by the very nature of her government, will not hesitate to subsidize the development and the sale of synthetic rubbers on the world market, even the newer *cis*-polyisoprenes, as another facet in her drive to world domination.

The competition for overseas markets now developing for the North American producer of synthetic rubber due to Soviet activities may be complicated by still another matter. While Western Europe will be consuming ever-greater quantities of synthetic rubber during the next ten years she may not be in a position to absorb large-scale imports by virtue of her own expansion of capacity. It is a fact that new synthetic rubber facilities are being constructed in Britain, France, Germany, Holland, Italy and even Spain. Who can tell but that in the next ten years Western

Europe may herself be an exporter of synthetic rubber, with a productive capacity capable of meeting the demands from South America, Asia and Africa!

The North American producer is thus faced with a problem which boils down to two possible alternatives. The North American producer can continue to expand home production of synthetic rubber in the hope that the rest of the world will absorb the surplus; or the North American producer can encourage Western Europe to build its own plants and base domestic production upon potential home demand plus a percentage for export. At the moment, North American producers seem to be following the latter course with any number of American companies building or helping to build plants in Western Europe.

On the face of it, the Western European synthetic rubber industry thus holds the balance between the North American and Soviet synthetic rubber potentials. The synthetic rubber producer in the United States and Canada, once faced with competition only from natural rubber, must now face up to another challenge—the challenge posed by Soviet capacity. This challenge can only be met by the concerted and thoughtful action of the Free World for it poses not only a serious economic problem but a problem with a bearing upon our survival.

Special Industry Report

Credit Rating

How the rubber goods manufacturer can evaluate his chance of getting a bank loan

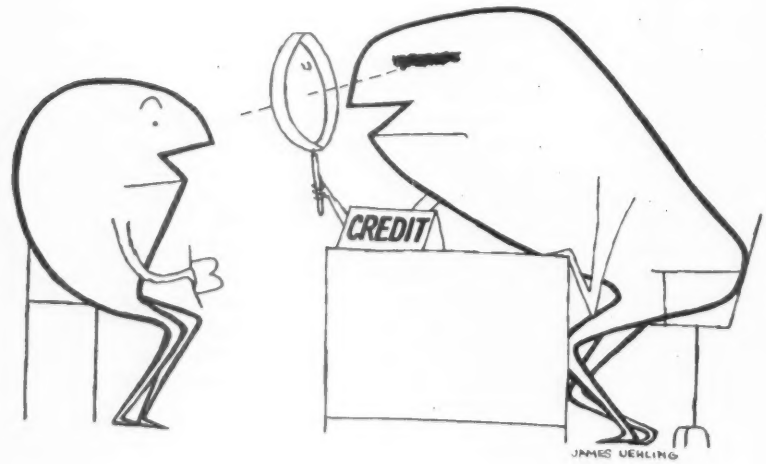
WITHIN the next few months millions of businessmen, caught short by the tightening profit margin squeeze, are going to sit down with their bankers to discuss the possibility of a short-term loan. Despite the current rolling adjustment or recession—call it what you will—the rubber industry on the whole is looking forward to a good market, though a highly competitive one for the rest of 1958. This is not to say that its members have not felt the current decline in business conditions, however, and among those millions of businessmen will be rubber products manufacturers seeking emergency operating capital.

Is there anything rubber goods manufacturers can do to improve their credit standing at a time when all lenders will be taking a sharp look at loan applications? Is there any way they can improve their chances of receiving needed financing when bankers are refusing other businessmen?

The answer to both these questions is yes, according to the American Institute of Certified Public Accountants, which offers the suggestions contained in this report. The basic premise is to understand how a banker goes about sizing up a credit risk.

Like many other businessmen, the rubber goods manufacturer may know his bankers personally. The bank may hold a mortgage on his home or have lent him money to buy the family car. Even so, he may not know how the bank judges him financially when he needs extra cash in his business.

When trying to decide whether to request a loan, remember that banks are in business to lend money. They want to give credit—providing there is a reasonable assurance that the loan will be repaid. But bankers do not take heavy risks. They must protect the depositors who have entrusted them with the money the manufacturer wants to borrow.



Lenders at present are taking a sharp look at loan applicants.

A business loan is made in the belief that it will help the borrower increase the earnings of his business so the loan can be repaid. The banker, therefore, is interested in sales and seeing how the credit he extends will help to boost them. If the loan is sizeable, the banker will probably require a great deal of information: personal references, balance sheets, income statements and historical details of the business organization.

This information will be sifted and studied to see how the applicant stacks up against five different tests—the so-called Five C's. First of all, the banker will want to know about the potential borrower's character and capacity. Is he a dependable businessman and reputable citizen in the community? Too, he will check the information supplied by references and records of payment of previous loans. And one can be certain that capacity for achievement as a businessman will be carefully evaluated. If the applicant does not pass these personal tests, the other three C's make little difference.

Capital comes next. Inexperienced businessmen often expect the bank to provide the lion's share of their financial backing. One probably will not get very far with a loan application unless he is willing to demonstrate his own confidence with a personal investment in a reasonable proportion to his existing and proposed debt.

Collateral, bankers say, does not make a bad loan good, but it may make a good loan better. Banks do not like to foreclose; they are less interested in the price inventory, real estate or other assets might bring in a forced sale than they are in normal ability to repay.

Conditions refer to the influence of business trends in general and the tightness or easiness of credit. Of course, the banker will know a great deal about the economic climate of the applicant's community and will be interested in his prospects in relation to it.

Supplying the basic information about business history should not be difficult.

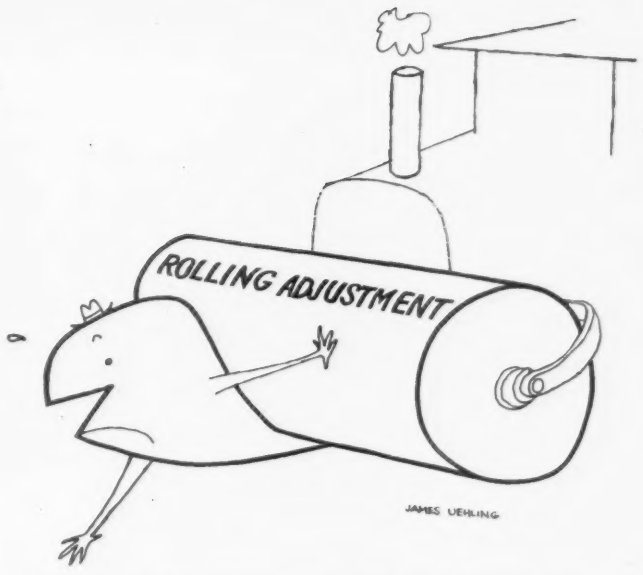
In small towns bankers sometimes know local businessmen so well they can fix their credit limits without seeing a loan application. But the larger the town or bigger the loan, the more details one will be expected to give—and the banker may require complete, accurate and dependable financial statements.

On a new loan one may be asked for statements covering past years as well as the current period. While most businessmen can provide a balance sheet of some sort, they are likely to have trouble when asked to supply income—or as they are sometimes called, profit and loss—statements. The balance sheet tells the banker approximately what a business is worth, working capital position and so forth. Income statement adds information about sales, margin of profit, earnings and trend of financial activities.

It goes without saying that providing authoritative financial statements and answering questions about them can prove difficult without professional accounting advice. Bankers are not impressed when businessmen give them information in round numbers or from memory. They want financial data in writing and in language they can understand — which means in accordance with accounting principles that other businessmen use and endose.

The services offered by certified public accountants are often invaluable in handling this function. Bankers know that they are professionally bound to high standards of conduct and competence. For example, under a recent addition to the professional accountant's code of ethics, a banker is assured that statements signed by a CPA will contain either an unqualified or qualified opinion, or will disclaim entirely an opinion as to the soundness of an applicant's financial condition. There can be no burying of facts, because if a CPA withholds his opinion, he must explain why he has done so.

For unsecured loans of $10,000 or more the tendency in banking circles today is to require an audit by a CPA. The CPA should accompany the applicant when he goes to the bank to discuss the loan. Then, if an audit is necessary, he, the banker and the CPA can agree on the information to be submitted.



The current rolling adjustment has caught many businessmen short.

Beware of attempting to restrict the scope of an audit. The audit is made so that the CPA can express an opinion on the applicant's financial statements. If the extent of his investigation is limited, he may be forced to disclaim an opinion on the fairness of the statements. Bankers prefer to receive "clean certificates," ones which the CPA has certified with no qualifications. In many cases he cannot do this unless he is permitted to observe inventories and confirm accounts receivable.

Too, bankers know that the majority of business failures—and bad loan risks—are caused by a deficiency in keeping adequate financial records and installing business-like accounting systems. It eases a creditor's mind to know that a CPA will be advising the borrower, whether it be a rubber goods manufacturer or any other businessman, on cost controls and telling him how to avoid unnecessary scrapes with the tax collector, another factor which bears on credit standing.

When a banker analyses financial statements, he is assessing one's economic health. Here are some of the ratios or standards which he uses—and which the reader can calculate himself—to determine chances of getting a bank loan:

(1) Current ratio—current assets divided by current liabilities should usually be at least two-to-one, but special circumstances are sometimes considered.

(2) Quick assets to current debt—cash, receivables and other ready cash items divided by current debt; one-to-one is the rule-of-thumb, but this too is flexible.

(3) Debt to capital—money owed to creditors compared to owner's money in the business; the lower the ratio, the better.

(4) Fixed assets to capital—real estate, buildings, fixtures divided by net assets; ratio should be kept as low as possible to avoid depleting working capital.

(5) Inventory to working capital—percentage of working capital tied up in inventory; an abnormally high ratio may result in shortage of liquid working capital to meet other expenses.

A seemingly unnecessary piece of advice to any borrower is to cooperate with his bank. Yet, many applicants will give information grudgingly or throw hurdles in the banker's way. There is no reason to withhold information on which the bank depends for a decision on a loan. At best, this attitude will only delay the loan; at worst it will lose it altogether.

What does the banker want to know?

The information sought by the banker varies greatly, depending on the nature of the business, the amount of the loan, and time required for repayment. A certain minimum amount of data are necessary for the analysis of a credit risk, however. An outline of such information would probably include statements on:

Cash on hand
Receivables
Inventory
Investments
Fixed assets
Other assets
Current liabilities
Other liabilities
Reserves
Owners' equity
Income statements
General information (month-end account balances, budgets, other items)

Abstracted from "Financial Statements for Bank Credit Purposes," published by Robert Morris Associates.

CCDA Holds 14th Annual Meeting

Commercial Impact of Synthetic Rubber Theme of Meeting

Program Features Three General Papers and Four Symposia

► Over 600 members and guests of the Commercial Chemical Development Association attended the 14th Annual Meeting held on March 27 at the Hotel Statler in New York City. Devoted to the theme "The Commercial Impact of Synthetic Rubber," the program for the meeting featured the presentation of three papers at a morning session, a luncheon speaker, and four symposia devoted to specific and technical aspects of synthetic rubber at the afternoon session. A banquet, held at the conclusion of the meeting, featured the presentation of a special honor award to Bernard H. Jacobson, vice-president of the Food Machinery & Chemical Corp.

Clayton F. Ruebensaal, director of commercial planning for the Texas-U.S. Chemical Co., served as chairman for the meeting with I. E. Lightbown (Enjay) as co-chairman. In his introductory remarks, Mr. Ruebensaal noted that only a few years ago a speaker at a CCDA meeting had observed that "Synthetic rubber is a great chemical development—but it is not commercial. It has never had to stand trial by competition. It is an athletic young man still walking around in a baby's toddler."

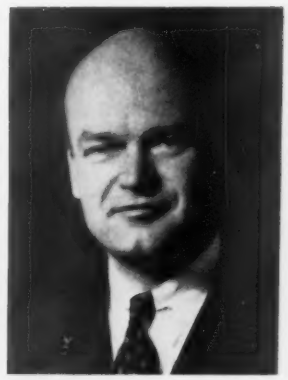
Now, said Mr. Ruebensaal, just three years after the disposal program, CCDA meets to make a detailed analysis of not only whether this newly-created industry has learned to "walk by itself", but how it has affected the growth pattern here and abroad of the natural product and other chemical rubbers which were not part of the disposal program.

Mr. Ruebensaal also served as chairman of the morning session at which introductory remarks were delivered by Frank E. Dolian, president of CCDA. The first speaker at this session was Alan J. Pickett, editor of *Rubber and Plastics Age, London,* who spoke on "European Developments in Rubber."

After discussing the influence that the price of natural rubber has had on the commercial development of synthetic rubber, Mr. Pickett offered an analysis on the production and consumption of synthetic rubber in Europe. He made reference to the replacement of natural rubber, not only by synthetic rubber, but by plastics. The exports of synthetic rubber to Europe were examined in the light of the European Common Market and the proposed Free Trade Area. Mr. Pickett's remarks on this question of synthetic rubber exports to Europe serve as the basis for this month's editorial and readers may turn to that section of this issue for additional comments.

The next speaker at the morning session was H. C. Bugbee, president of the

Messrs. Ruebensaal (left) and Lightbown (right) served as chairman and co-chairman, respectively, of the CCDA meeting.



The three morning papers were delivered by A. J. Pickett (left), H. C. Bugbee (center) and O. V. Tracy (right).

Natural Rubber Bureau, Washington, D.C., who spoke on "Commercial Developments in Natural Rubber." Mr. Bugbee noted that competition between natural and synthetic rubber producers has been a boon to the over-all consumption of rubber and that the two industries will continue to supplement each other. He based his prediction on natural's ability to better than hold its own on price and the potentials of natural rubber research being carried on in laboratories in Southeast Asia, England, France, and Holland. Such research is directed at making natural quality competitive in those areas where synthetic is now superior, improving the benefits that natural already holds over synthetic and creating new areas into which natural already holds over synthetic and creating new areas into which natural alone can fit.

To carry the results of this research to American consumers of natural rubber, Mr. Bugbee announced that plans were underway for a technical service organization in this country. "We expect before the end of this year to establish a unit which will constitute a technical and scientific liaison between our own research organizations and the manufacturers and scientific organizations dealing with rubber in this country," he said.

Notes Market Divisions

Currently, the market for rubber in the U. S. is divided three ways, Mr. Bugbee declared. About a third of the market belongs to natural on the basis of superiority in resilience and heat dissipation. Another third goes to synthetic for reasons of toughness, abrasion resistance and similar characteristics. The last third can use either rubber and is determined pretty much on the basis of price.

Casting an eye ahead, it is generally accepted by economists viewing rubber's future that over the next 5 to 6 years all the natural produced will be consumed by a rising world demand that in each past decade has doubled its rubber consumption. In what has now become a twin commodity market, Mr. Bugbee stated, there is enough business for both competitors.

The final speaker at the morning session was Osgood V. Tracy, president of the Enjay Co., New York, N. Y., who delivered a paper on "Commercial Developments in Synthetic Rubber." Mr. Tracy examined the three-year period since the synthetic rubber plants were turned over to private industry, pointing to the rise in synthetic capacity during the period and the stable price which the commodity has exhibited during the years.

Mr. Tracy went on to speak on the technological developments which have taken place recently, particularly the development of the newer synthetic rubbers. He also touched upon developments in rubber products themselves, and the manner in which these are likely to broaden the market for synthetic rubber.

Raw Materials Consumption

The growth of synthetic rubber, he indicated, has had great bearing upon raw materials consumed in its manufacture. Carbon black, for one, he said, has been greatly stimulated by the growth of synthetic rubber. In conclusion, the speaker cited those industries which have benefited through advances in synthetic rubber technology, such as the paint and paper industries.

At the conclusion of Mr. Tracy's address, the morning session adjourned and members and guests gathered at a luncheon at which the featured speaker was John R. Blandford, counsel to the Committee on Armed Services of the House of Representatives. Mr. Lightbown presided at the luncheon session. Mr. Blandford chose as his topic, "Congress and the Synthetic Rubber Industry." Mr. Blandford played a part in synthetic rubber disposal activities from the early days in 1947 when he served as counsel to a subcommittee of the House Armed Services Committee which first investigated the question of disposal.

In his address at the CCDA luncheon, Mr. Blandford took his audience through a step-by-step outline of the procedures and problems involved in drawing up adequate disposal legislation. As a result of the legislation which was eventually passed, he said, we find that the synthetic rubber industry today is a going profitable business and the predictions made in 1953 as to the future of synthetic rubber have been fulfilled.

Luncheon over, members and guests assembled for the afternoon activities which included the four symposia mentioned earlier. Panel A, the first of the concurrently held discussions, concerned itself with "The Commercial Development of Purchased Government Facilities." William P. Gee, president of the Texas-U.S. Chemical Co., presided at this panel discussion. In his remarks, Mr. Gee examined the growth of the synthetic rubber industry from the time that private companies took over the plants, pointing up some of the problems which have developed over the years.

He noted, for example, that the industry now finds itself in a period of marked decrease in consumption and resultant cutbacks in production with competition intensified. This situation, he declared, indicates the need for an economic reappraisal of the industry under operating conditions which see plants running at well below full plant capacity. The speakers who composed the panel addressed themselves to this and similar problems.

Butadiene Availability

The first speaker, Gordon A. Cain, vice-president of the Petro-Tex Chemical Corp., concerned himself with the matter of butadiene availability. He discussed those expansions which the butadiene producer has made in an attempt to meet the demands of the synthetic rubber producer. He stated that 1957 had been a big year for domestic butadiene production and 1958, he observed, will be a year of expansion for foreign producers. As for the domestic picture, three years ago, he noted, there were only three companies producing butadiene, and today there are fifteen or more if all the participants in the various joint companies are included. The amount of money being spent for research in this field has increased manifold, with a significant part of the money going into catalyst research. Mr. Cain stated that the solution to finding broader uses for butadiene lies in research. The fact remains, however, that the butadiene producer is "for better or for worse . . . tied to the synthetic rubber industry."

The next speaker at Panel A was John P. Cunningham, manager of the Synthetic Rubber Sales Division of the Shell Chemical Corp. Mr. Cunningham's remarks were directed to the differences between Government and private operation of the synthetic rubber industry from the marketing standpoint, and particularly from the viewpoint of the rubber products

The moderators at the four panel discussions in the afternoon included (left to right) W. P. Gee, C. J. Harrington, W. B. Plummer and R. R. Ormsby.

manufacturers who did not participate in the purchase of the plant facilities.

He pointed out that no small business manufacturer suffered from lack of synthetic during the period of rubber shortage which occurred soon after plant takeover during the boom year of 1955. Independent operators were in fact able to buy synthetic rubber while producer-consumers went into the higher priced natural rubber market for an increased portion of their total requirements in order to make this possible.

He commented briefly on the growth of research, development and technical service organizations under competitive marketing conditions, mentioning that a single company was currently spending approximately one half as much as the Government during the later years of Government control for which figures have been published.

Cost of Advertising

Advertising, which was not employed under Government management, has proved a valuable medium for the dissemination of technical information. Competitive marketing has also brought about growth of technical literature in the form of bulletins, brochures, catalogs and other promotional material. Under Government operation, product distribution to consumers was handled by a single central agency, an efficient arrangement but one which required advance ordering. Today competition has assured every customer prompt shipment of the product he desires, in the package he prefers, made by the manufacturer he favors, from a convenient stock point, reducing his advance commitments and the size of his raw material inventories.

Three years' operation under free competition has resulted in steadily increasing multiplicity of products to meet customer's special requirements. The trend is towards transferring initial compounding operations from the consumer's plant to that of his rubber supplier where he believes they can be performed more cheaply. Mr. Cunningham stated that he had checked with his home base on the preceding afternoon, and found that his company had available for immediate shipment 150 solid rubber products, representing 64 rubber types in different packages.

Among the questions asked Mr. Cunningham from the floor was a request to explain the stability of the synthetic rubber price since plant takeover. He replied that in his opinion competition had kept the price from going up while costs had kept it from going down, and that the purchaser of synthetic rubber was today getting one of the best buys in American industry.

The next speaker at the panel discussion was to have been Lucien O. Crockett, president of Goodrich-Gulf Chemicals, Inc. Mr. Crockett, however, was unable to appear and in his stead, Paul W. Cornell, vice-president of Goodrich-Gulf, appeared. Following Mr. Cornell's talk, Ancel B. Leonard, director of the Rubber Chemicals Division of the Phillips Chemical Co., spoke. Mr. Leonard directed his comments to the "Commercial Impact of Synthetic Rubber."

The speaker first discussed the composition of a typical technical service program as furnished by a synthetic rubber producer. Mr. Leonard observed that there are several major problems facing the American synthetic rubber producing industry. One of the most serious problems, he stated, is the matter of an inadequate selling price. The selling price now for butadiene-styrene rubbers is the same as it was three years ago. In the meantime, the cost of new capital equipment, freight, labor and most raw materials and supplies has advanced substantially.

Today's prices, he declared, do not permit a satisfactory return on investment, do not adequately provide for replacement of worn out and obsolete equipment, and do not provide the funds needed for research and development to keep the industry growing and healthy. Continuation of such a situation, he stated, can result only in stifling progress to the disadvantage of the rubber goods manufacturer, and the rubber consuming public.

Influence on Other Industries

While Panel A was in progress, other interested members and guests attended Panel B which was devoted to "Influence of Synthetic Rubber on Other Industries." C. J. Harrington, director of sales for the Elastomer Chemicals Department of E. I. du Pont de Nemours & Co., Inc., served as moderator of this panel discussion. In his remarks, Mr. Harrington stated that the question before the panel related to the effect on end use industries of synthetic rubber as an industry. He observed that as recently as twenty-five years ago there was no such thing available as synthetic rubber. Today, many different types of synthetic rubber are made. Generally speaking, current polymers can be controlled as to average molecular weight and the end groups on them, but the exact chain structure is largely happenstance. We are now entering an era, he said, in which chain structure will be more exactly controlled, and where we can polymerize in place.

For his part in this panel discussion, R. A. Schatzel, vice-president of the Rome Cable Corp., spoke on "The Effect of Synthetic Rubber in the Insulated Wire and Cable Industry." Mr. Schatzel stated that with the many new uses of electricity and the variety of appliances developed, as well as extensions and improvements in established uses, the place of synthetic rubber in this industry is increasingly important. Prior to World War II, the wire and cable industry used from 3 to 4 per cent of the total rubber consumed in the United States. Today, notwithstanding the great increase in consumption of rubber, wire and cable still use from 3 to 4 per cent of all rubber consumed in the United States in addition to an equal or slightly larger amount of plastics.

Wire Industry Problems

Mr. Schatzel observed that the wire and cable industry today is faced with the potentially serious problem of being stripped of its synthetic rubber supply. This problem in the cable industry stems from the Federal Mine Safety Regulations, Schedule 2F, which Mr. Schatzel feels should be suspended immediately. These regulations have been based on the heat and flame resistance of synthetic rubber insulation and protective sheath, with which the wire and cable industry can no longer comply. Some other means of protection against mine explosions due to burning of flexible cable must be developed.

The use of lead sheathed cable will be necessary in the place of synthetic sheaths which have become commonly used for power and communication cables. Since the lead presses have largely been discarded, it will take months to replace, and many additional presses will be required to supply the larger volume developed since their use years ago.

The wire and cable industry needs to change its technology and manufacturing processes; restore and increase discarded types of equipment and methods, increase floor space and labor in its plants. This progress will be marked by polymers with greater moisture and heat resistance, as

well as better electrical properties for high-voltage applications. Most desirable would be the development of a single polymer combining all these properties at lower cost, for general applications up to operation at 100°C., and an inorganic polymer for high temperature applications up to 600°C. Mr. Schatzel concluded that this will greatly simplify problems of technology, production and sales.

In his discussion on the "Effect of Synthetic Rubber Upon Tires, Tubes and Mechanical Goods," Sheldon C. Nicol, chief chemist, Tire Development, Goodyear Tire & Rubber Co., emphasized that many significant accomplishments have been made in recent years since the emergence of synthetics as a factor in rubber production. An over-all average use pattern of about 63 per cent synthetic testifies to the importance of synthetic rubber as an elastomer. Many instances may be cited where synthetic rubber outperforms natural rubber, he said.

Mr. Nicol cited three factors that determine choice of natural or synthetic rubber for a product as, (1) Quality, (2) Cost, and (3) Availability. New improvements in synthetic rubbers are expected to further enhance the position of synthetic versus natural rubber.

Wide Synthetic Usage

For his part in the discussion on the "Influence of Synthetic Rubber in Other Industries," G. H. Swart, research director of the General Tire & Rubber Co., reported that most Americans are literally surrounded by products utilizing synthetic elastomers, which contribute greatly to the very high standard of living enjoyed by most Americans. The paint on walls, the cushioning and upholstery of our furniture, the rug underlay, the books and magazines we read and many of the component parts of our kitchen and household tools bear testimony to the importance of elastomers in these varied applications. In 1956, 51 million gallons of latex paint were produced, which amounted to a sales figure of almost $300 million. Of this amount, styrene-butadiene polymers accounted for 38.5 million gallons, polyvinyl acetate 10.5 million gallons and acrylic polymers about 5 million gallons. Most paint technologists believe that this is merely the beginning.

Another important application for elastomers is in foam used as a cushioning material. Although natural rubber foam made many materials such as cotton wadding obsolete in critical applications, new materials now challenge the monopoly natural rubber foam enjoyed previously. Not only are the synthetic latices competing in this field, but also other materials have entered the competition, which are entirely different chemically and contain no unsaturation. One of these materials is the urethane family of foams. In 1957, the total urethane foam market was estimated to have been 18 million pounds. The estimated market for this new foam material in 1958 is 45 million pounds.

Mr. Swart stated that one of the most novel and unique applications of synthetic elastomers is their use as plasticizers. When incorporated into hard and brittle plastics as flexibilizers, these synthetic rubbers improve the impact resistance and act as a viscosity stabilizer of the rubber-resin combinations at high temperature. Mr. Swart estimated that in 1957, 175,000,000 pounds of high impact materials were used in American industry. The development and applications of such synthetic elastomers has progressed at phenomenal pace over the past decade, but there is every indication that in the future, synthetic elastomers will enjoy an almost unlimited potential in the use of the products of tomorrow.

J. R. Blandford

addressed the luncheon session of the CCDA meeting.

Another of the speakers at Panel B was J. R. Forrester, Jr., principal research engineer, Engineering Research, Ford Motor Co. Lt. Colonel H. C. Hamlin, Assistant Chief of the Organic Materials Branch, Materials Laboratory, Wright Air Development Center, also spoke at this panel discussion.

Early Military Problems

In the early days of military aviation, said Col. Hamlin, castor oil was used for general lubrication and hydraulic applications. Natural rubber did an excellent job of providing needed hose, seals, etc. for use from —40 to +180°F. Then, during the period from the early thirties until the end of World War II, castor oil gradually gave way to mineral oils for several reasons including availability as well as the greater operating temperature range of the mineral oils.

This change, however, eliminated natural rubber and a new oil resistant synthetic took over—namely neoprene, and thus began the never ending battle to keep the physical properties of the rubber material equal to the job it must do. Neoprene provided oil resistance but expanding temperature requirements added new problems. Near the close of World War II, or shortly thereafter, nitrile rubber began to be widely used in military aircraft and has continued in general use even today.

Even though our capabilities are quite respectable today, our requirements consistently outrun them. Fortunately elastomer research has been active and fruitful. Thanks largely to some very effective and closely coordinated research programs conducted by both industry and the military services, a number of new super elastomers are available today — Poly FBA, Vyram, Kel F Elastomer, Viton A, oil resistant silicones, and others. Among these materials are qualities of fluid and oxidation resistance, thermal stability, and low temperature serviceability never dreamed of during the castor oil days.

That is the impact of synthetic rubber on the military aircraft industry and the Air Force, Col. Hamlin stated. A somewhat similar situation either exists or will exist with respect to tires, cabin seals, and a host of other applications for rubber that can be found in aircraft. Many attempts have been and will be made to design around rubber—none of them have been wholly satisfactory. This is because if it can live in its environment, there is nothing that can do rubber's job half so well as rubber.

The third of the concurrent panel discussions, Panel C, was devoted to "Growth Forecasts for Rubber and the Impact of Other Materials." Ross R. Ormsby, president of the Rubber Manufacturers Association served as moderator of this session. In his introductory remarks, Mr. Ormsby declared that we all must be fully cognizant of the fact that when the rubber industry talks about 63 per cent today in domestic consumption and possibly 65 to 70 per cent in 1960's we are really talking about the distribution breakdown in the "conventional" rubber types. Other firmly established elastomers produced by or used in the rubber industry today are mounting in tonnage every year. These include such materials as other copolymers of butadiene, "Hypalon," the silicone rubbers, "Thiokol," the fluoride rubbers, etc.

In addition, there are the newer plastic elastomers manufactured by both plastic and rubber producers which are used to almost the same extent outside the rubber industry as in it. These include materials such as the elastomeric vinyls and polyurethanes. Other, even newer, types are appearing on the horizon which must also be considered, such as the synthetic-natural polyisoprenes, *cis*-polybutadiene, elastomeric polybutylene or propylene copolymers.

Manufacturing Horizons Broadened

As the rubber industry is actively concerning itself with the production and use technology of these materials, we must concern ourselves with their growth prospects and the evaluation of their increasing share of the total market, Mr. Ormsby declared. The development and production of synthetic rubber has had the effect of extending the horizons of the rubber manufacturing industry, he noted.

One of the participants in the panel discussion which followed was S. M. Martin, Jr., vice-president and sales manager of the Thiokol Corp. Mr. Martin, speaking on "Growth Forecast for Specialty Rubbers and Their Place in the Over-All

Industry," stated that the total consumption of all types of elastomers, both natural and synthetic, has increased sharply over the last ten years, and it is predicted that this rate of increase will continue for at least the next seven to ten years.

The speaker stated that it is in the non-transportation field that the specialty rubbers find their greatest opportunity. It is also in this field of activity that we find the greatest diversity of activity in adapting the best polymer to a specific need. The progress that has been made in replacing other raw materials with elastomers is largely due to these facts: (1) Polymer research is constantly producing improved basic raw materials; (2) Rubber chemists are working intensively to supply better compounds and to improve processing techniques; (3) Design engineers are utilizing these newer materials and better compounds in the fabrication of improved products.

Mr. Martin went on to discuss some of the specialty rubbers, including "Thiokol", nitrile rubber, butyl rubber, and touched upon silicone rubbers, the newer fluorohydrocarbon elastomers, chlorosulfonated polyethylene polymers, acrylic acid copolymers, butadiene methyl vinyl pyridine elastomers, etc. These and other specialty rubbers, he stated, all have specific properties that make them useful and of interest industrially. Their use is expanding and will continue.

Discusses "Input-Output"

John R. Strickland, editor of *Chemical Information Services* at the Stanford Research Institute, in his address, stated that a continuing research program in the chemical industry has been operating for nearly ten years at the Stanford Research Institute. It would be useful to examine the rubber industry from a few selected viewpoints with an eye to bringing out some of the important aspects which will govern its future. One of the most useful of industrial analyses that has been developed in recent years is the field called "input-output." This analysis is based on the theory that the output of any industry makes necessary certain inputs of materials, services, labor and capital, and that the input must equal the output. The output of each industry is identified both by consuming sectors and amounts.

The rubber industry is an intermediate industry depending upon other industry segments for raw materials, and almost none of its products go directly to final consumers. One viewpoint from which to study rubber is on an end-use group basis; the grouping of chemical products according to their use-characteristics without regard to who is producing the product or its chemical make-up. On this basis, it is possible to give consideration to similarities in marketing characteristics and to study the degree to which synthetic products compete with naturally derived products. On an end-group basis, synthetic elastomers range fourth behind synthetic fibers, plastics, and synthetic medicinals.

In looking at synthetic rubber, we see that following an initial period of rapid growth there has been a slow rate of development. As weighed against a natural material, it must be considered with mixed feelings inasmuch as some of the companies engaged in the manufacture of synthetic are also producers of natural rubber. It must be emphasized that although the rubber industry does not sell directly to the consumers, its future is largely governed by the consumer. Forecasts at Stanford Research Institute indicate that by 1975, per capita purchasing power will have increased at an average rate of six per cent per year.

The future growth of the rubber industry will be influenced by factors similar to those which affect the over-all chemical industry. There are three general means by which the chemical industry has grown: first, by development and the introduction of completely new products which have not heretofore been available; secondly, by acting as suppliers to rapidly growing industries, and thirdly, by supplanting natural materials with synthetic materials of lower cost or improved properties. It is reasonable to expect that continued support of economic and technical research programs will prove rewarding, Mr. Strickland said.

Carl O. Nygaard, director of business research for the B. F. Goodrich Co., next addressed the meeting, speaking on "Growth Trends in Rubber." Mr. Nygaard stated that world demand for new rubber has shown a steadily rapid growth trend since 1947, averaging about a six per cent increase per year. The new rubber consumption in the United States has shown a growth trend of about 3¼ per cent in recent years which is about in line with the growth in total U.S. industrial production volume. Natural rubber consumption is currently at about 1.9 million tons per year which is 75 per cent more than before World War II, in addition to the fact that about all the natural rubber that could be produced is being consumed today. In effect, the development of synthetic rubber, rather than substituting entirely for natural rubber, made possible the rapid trend in total world new consumption in the past 15 years.

In 1957, 40 per cent of the world new rubber consumption was synthetic and the trend is for this percentage to increase gradually. This trend has been supported by a continuing increasing share of synthetic rubber in the U.S., from 52 per cent in 1954 to 63 per cent in 1957. The free world, excluding the U.S., used very little synthetic rubber in the years immediately following World War II but by 1957, consumption rose to 24 per cent. It appears that Russia uses about two thirds synthetic, one third natural, whereas in satellite countries the ratio is 25 per cent synthetic. The total Soviet bloc consumption is currently estimated at about 550,000 long tons per year with roughly 55 per cent of the total being synthetic, accounting for about 17 per cent of total world new consumption.

In the 10 years ahead, consumption of new rubber in the U.S. is expected to grow by about 3 per cent per year compounded, based on the estimated trend in motor vehicles in operation and in industries using rubber products. In 1947, for example, there were about 29 million cars in use. Last year the figure reached 51 million and by 1967 it is estimated that there will be 70 million passenger cars on the nation's highways. The truck-bus fleet has also shown rapid growth. There are presently 10½ million trucks and buses in operation. By 1967 the figure will be about 13½ million and the volume of industrial production in this nation is expected to be 1/3 higher than in 1957 with an expected demand for industrial rubber products to increase slightly faster than this.

Cites Synthetic Consumption

The United States consumed about 923,000 long tons of synthetic rubber in 1957. By 1967 this figure will be close to 1½ million long tons—an increase of more than 60 per cent. Just as the conventional types of synthetic rubber made possible a more rapid growth in total new consumption in the past 15 years, the years ahead may see a more rapid increase in total consumption as the result of the development of specialty polymers which will do things that conventional types cannot, Mr. Nygaard concluded.

J. D. Mahoney, general sales manager of the Mobay Chemical Co., in his remarks to the group, pointed out that the markets for urethane cushioning foams are presently in the automotive and home furnishing fields. He said the 70 per cent

DuPont Grants Announced

► E. I. du Pont de Nemours and Co., Inc., Wilmington, Del., has announced its annual program of aid to education, awarding grants totaling nearly $1,150,000 to 135 universities and colleges. The total for the next academic year is about $100,000 more than DuPont contributed for this school year. Most of the increase and more than half of the entire program are grants to colleges and universities for strengthening the education of scientists and engineers. At the same time, grants for fundamental research are being continued, as are grants for fellowships, which once made up the entire plan. As in previous years, decisions on the use of the funds and the selection of people to receive individual grants are left to the institutions. In recent years, discussions with educators have indicated that maintaining high standards of teaching is a major problem at all levels of education in view of higher costs and increasing enrollments. DuPont's grants for advancing teaching, which proved effective in science, mathematics, and other liberal arts courses, are now being extended to medical schools for the first time.

sales gain in one year is confirmation of the growing acceptance of urethane foams by both industry and consumers, and that the increase is even more significant when viewed against the general slide-off in business throughout the country during this period.

Based on the current rate of market acceptance, Mr. Mahoney envisions a total market potential of about 45 million pounds for urethane foam this year. Commercial urethane foams average about two pounds per cubic foot, he said, which means this rate of production would fill a building a block square and 50 stories high.

New developments which will further increase the profitability in both manufacture and use of urethane foams are underway, he said. He attributed the fast rise of this new industry to the intensive research programs of the past two years by both basic suppliers and fabricating companies. "More than $500,000 a month is currently being spent on basic research in the urethane industry," he said, "to speed up the transition of new urethane materials from the laboratory testing stage to the production lines."

Among the new urethane materials now being readied for early introduction to industrial markets is a castable, synthetic rubber which has such a high level of abrasion and impact resistance that it will outwear ordinary rubber materials eight to ten times. Easily-fabricated components for heavy duty uses, such as construction, materials handling and industrial equipment, have already caught the eye and imagination of industrial designers in these fields, Mr. Mahoney said. "With urethane rubber the automotive industry can now incorporate many of the design innovations they have postponed for lack of a suitable material that combines the required properties of hardness, strength, elasticity, oil resistance and durability." A market upwards of 750,000 pounds is foreseen in 1959 for urethane rubber in these uses.

Application Research

Application research for the expanded use of urethane cushioning foams is now underway in such diverse fields as mattresses, industrial packaging, interlining, carpet underlay, and thermal and acoustical insulation for both commercial building and home construction, Mr. Mahoney concluded.

The fourth panel discussion which took place in the afternoon of March 27, Panel D, was devoted to "Growth Prospects for Rubber Raw Materials and Compounding Agents." William B. Plummer, consultant, served as moderator for this session. In his introductory remarks, Mr. Plummer set the tone for the discussion which followed by pointing out the rapid growth in the number and types of compounding ingredients which have made their appearance in recent years.

The advent of the synthetic rubbers, he said, is partly responsible for the great increase in the number of compounding ingredients. Advancing technology has also caused the introduction of a good number of new compounding materials.

Bernard H. Jacobson

Named CCDA Honor Award Winner for 1958.

Howard H. Heilman, consultant, one of the participants in this panel discussion, outlined some of the economics involved in rubber raw material procurement and use. Mr. Heilman spoke of the rate of growth of the rubber industry and the effect this has had upon the cost and availability of butadiene and styrene.

Discusses Other Materials

Other materials touched upon by the speaker included isoprene, isopentane and acrylonitrile. On this latter material, Mr. Heilman pointed out that the capacity to produce acrylonitrile in this country exceeds the current production by some 100 million pounds. Styrene is readily available, he said. The cost is low and we have the capacity to produce 1.4 billion pounds. The cost of isoprene, he observed, limits its present use, while isopentane costs two to three times that of butadiene.

Carl W. Sweitzer, director of research and development for the Columbian Carbon Co., chose as the topic of his talk, "Reinforcing Pigments." He stated that there will always be an adequate supply of reinforcing pigments since the raw materials from which they are prepared are available in unlimited quantities.

The primary function of pigments is to reinforce or toughen the rubber, with a variety of secondary functions including dilution, property modification and coloration. Of these, the reinforcing pigments are by all odds the most important, he said. For purposes of classification they are normally listed as either carbon blacks or non-carbon blacks. The volume of these pigments used by the rubber industry in this country in 1955 totaled about 1,300,000 short tons, which was about 75 per cent of the total new natural and synthetic rubber used in the same year. More than 50 per cent of this pigment total is supplied by carbon black.

In the case of carbon black the raw material is hydrocarbon, which need not necessarily be petroleum. The fact that natural gas and petroleum oils have been used to date is almost entirely a matter of economics. In the absence of all mineral hydrocarbons the carbon black industry could function with such raw materials as turpentine and vegetable oils.

The pigment industry is able to meet every challenge for the right reinforcing pigment. The furnace blacks developed for the wartime GR-S were an outstanding example. The fumed silica pigments for silicone rubber are another example.

Lignin reinforcing agents have been under investigation for some years, but the prospects seem less promising than the fine silicas as a threat to carbon black. They are prepared by precipitating waste liquors of the wood pulp industry with CO_2 or acid. There seems to be no indication of a major shift in the distribution of these various reinforcing pigments within the next few years, unless of course new rubbers are introduced with basically different pigment requirements, he concluded.

Continuing the "Growth Prospects for Rubber Raw Materials and Compounding Agents" discussion, William F. Tuley, group manager of Chemical Development, Naugatuck Chemical Division of the U. S. Rubber Co., reported that synthetic organic chemicals are essential to the manufacture of all rubber products. They comprise a wide variety of chemical types, perform numerous functions, and, in total, provide a very large market for the organic chemical industry. Chemicals for rubber processing may be conveniently placed in two principal categories; first, those chemicals used in the manufacture of synthetic elastomers, and second, those chemicals used in the conversion of natural rubber or synthetic elastomers into fabricated rubber products.

Notes Growth Factors

The major factor in the growth of rubber processing chemicals is the volume of synthetic elastomers produced and the quantity of all rubbers consumed in the rubber producers industry. Consumer volume is the controlling factor. Synthetic production is forecast to increase about 12 per cent in the next three-to-five year period. The increase is reduced by the expectation that exports will be less because of the increasing overseas synthetic production. A slightly increasing percentage of synthetic rubber in domestic consumption is forecast. The 1962 total United States' consumption of new rubber is forecast to increase about 11.5 per cent over 1957. It appears that the rubber industry is increasing annual rubber consumption at a rate of about 2 per cent, Mr. Tuley observed.

The major types of synthetic organic chemicals used in the manufacture of synthetic elastomers are emulsifiers, peroxide catalysts, mercaptan modifiers, shortstops, and stabilizers. Except for butyl, these synthetic elastomers are made in an emulsion polymerization system. For this purpose special fatty acid or rosin acid soaps and some syndets are used to emulsify the monomers and to give the desired stability of the polymer latex.

The market for rubber chemicals com-

prises a total of about 1,500 companies and 1,800 factories, he said. However, about 60 per cent of the rubber goes into tires and tire products, and 70 to 75 per cent of the rubber is consumed by the five largest tire and rubber products companies. The manufacture and sale of rubber chemicals is well dispersed among a number of the larger and also smaller chemical companies along with several of the rubber companies. It is a dynamic business, and no supplier can afford to assume that new competition may be ignored. Mr. Tuley concluded that alertness and fast action is required to meet the changing needs of the rubber industry, and to contribute through better chemical products, to the constantly improved performance of the products of the rubber industry.

Compounding Ingredients

For his part in the discussion, H. A. Winkelmann, vice-president and technical director of the Dryden Rubber Division of the Sheller Manufacturing Corp., reported that statistics are not available that give a breakdown of the consumption of various compounding materials in elastomeric compounds. It is not easy to follow the growth or decline in consumption of various materials, he said, since changes have taken place with the advent of synthetic rubber. Plasticizers are now used in much greater volume than when natural rubber was the only elastomer available. Plasticizers act as softeners, reduce mixing and milling temperatures, decrease power costs, aid in incorporating and dispersing dry ingredients, improve flow during molding, and aid in extrusions. For natural rubber compounding, light process oils, soft asphalts, pine tar products, petroleum and coal tar pitches, various resins and esters, are the plasticizers most widely used.

Many plasticizers decrease the tackiness of the uncured stock, which may be necessary for adhesion of surfaces in forming the final cured product. Tackifiers may therefore be necessary. Rosin acids in place of stearic will help to increase tack and the addition of natural rubber to butadiene-styrene stocks will also help. Some of the best tackifiers are the coumarone-indene resins, hydrogenated rosin esters, polymers of styrene and substituted styrenes, polybutenes and metallic resinates, the speaker observed.

Phenolic resins may be added to modify the properties of elastomeric compounds and about 10 million pounds are consumed annually in all elastomers. It has also been known for many years that dimethylol phenol resins will vulcanize natural rubber, butadiene-styrene, and nitrile rubber. Good vulcanizates with low compression set are obtained with no compounding ingredients present. Carbon blacks and metallic oxides speed up the cure. Recently, dimethylol phenol resins have been introduced as vulcanizing agents for butyl rubber compounds.

Blends of reclaimed rubber and phenolic resins, polyethylene, polystyrene and acrylonitrile resins are available as substitutes for hard rubber and plastics. High molecular weight polyethylene oxides are used as coagulants in foam rubber and in making dipped goods. Low molecular weight, wax type polyethylenes are recommended as processing aids for elastomeric compounds. Conventional high molecular weight polyethylene has not found any significant use in rubber compounds. Dr. Winkelmann said that quite recent data indicate that the new low pressure or linear polyethylenes show promise for blending with rubber, but these developments are not yet conclusive.

CCDA Honor Award

The technical portion of the meeting over, members and guests assembled for the banquet which featured the presentation of the 1958 Honor Award to Bernard H. Jacobson, vice-president of the Food Machinery & Chemical Corp. Mr. Jacobson was honored for his accomplishments in both the organic and inorganic chemical industries, his pioneering in the field of commercial chemical development, and, especially, his important contribution to the commercial development of plasticizers. The banquet session was presided over by A. J. Dirksen, chairman of the Program Committee and eastern general sales manager of the American Potash and Chemical Corp. The Honor Award was presented to Mr. Jacobson by Frank E. Dolian, president of CCDA.

In accepting the award, Mr. Jacobson recalled some of his early associates and their accomplishments and the contributions they had made to his own development. He also related the manner in which resins first came into commercial use and how they grew to their present stature. He noted that there are 31 major test areas for plasticizers today. Mr. Jacobson observed that although literally hundreds of new plasticizers are available today, dioctylphthalate still meets more of the basic test requirements than any other.

With the conclusion of the 14th Annual Meeting, the new officers of CCDA took office. L. E. Johnson, supervisor of the Industrial Chemicals Section, Development and Research Division, International Nickel Co. is the new president. The new president-elect is Walter J. Riley, manager of the Market Development Division, Mineral Products Division, Food Machinery & Chemical Corp. Mr. Dirksen took office as treasurer, and J. G. Affleck, manager of the Rubber Chemicals Department, Organic Chemicals Division, American Cyanamid Co., has taken over as executive secretary.

New Bakelite Plant On Stream

► Bakelite Co., New York, N. Y., has announced that a new, fully automated plant for making high-density, low-pressure polyethylene is in commercial production at Institute, West Va. The plant's capacity will be 30,000,000 pounds a year. Bakelite is also planning to put into production another high-density polyethylene plant in Seadrift, Texas, with a capacity of 25,000,000 pounds a year. The plant at Institute utilizes Ziegler-type catalysis, while that at Seadrift will turn out Phillips-type resins. With the two, plus a plant for low-density polyethylene at Whiting, Ind., Bakelite expects to have a broad range of polyethylene resins and compounds.

Congoleum-Nairn Promotes Cook

► Frederick H. Cook has been elected to the new post of executive vice-president of Congoleum-Nairn, Inc., Kearny, N. J. Mr. Cook, formerly vice-president for the Gold Seal Division, has also been elected a member of the executive committee. He was elected a director in March, 1957.

► The Petro-Tex Chemical Corp. plant at Houston, Texas, shown above is said to be the world's largest non-captive butadiene plant, with a capacity of 300,000 tons annually. In the foreground are the twin Houdry butane dehydrogenation units, installed in the fall of 1957 to double the capacity of the initial plant purchased from the Rubber Reserve Corp. in May, 1955. Butadiene purification towers (middle ground, left) serve both the new Houdry units and the original Shell butylene dehydrogenation units (middle ground, right). Power plant and service facilities can be seen in the rear ground and the tank farm and cooling water pond are in the immediate foreground.

General Motors Test Program Evaluating Nylon Cord Use

► According to recently published reports General Motors Co., Detroit, Mich., is conducting an experimental program that may, in the future, have bearing on the use of nylon tire cord as opposed to the currently more popular rayon tire cord. In the tests, 40,000 1958-model Chevrolets have been equipped with unmarked nylon cord tires in order to check consumer reaction. If nylon is generally approved, Chevrolet may use nylon cord tires as standard equipment on many of its 1959 models, or offer them as optional equipment at no extra cost. Nylon's greater protection against blowouts would then be cited as a reason car buyers should choose the Chevrolet over competitive makes. If Chevrolet decides to switch over to nylon cord tires on its 1959 models, nylon producers hope Ford and Plymouth will follow suit.

If nylon does not receive popular approval, the company will presumably continue to use rayon cord tires. Rayon now accounts for 99 per cent of cord used in original equipment tires. Last year, this market utilized 300 million pounds of rayon yarn, or 36 per cent of all rayon sold. Nylon manufacturers, out to wrest this business away from rayon producers, already have succeeded in having nylon cord tires made standard equipment on the Chrysler 300 series, and optional equipment on at least seven other higher priced models.

Price Factor Cited

Growth of nylon cord tire sales has been retarded by their higher price and by complaints that they whine and thump when rolling over the road, trade sources state. Tire men point out, however, that expanding production has already cut the premium on nylon cord tires from 10 to 5 per cent and some are convinced that if output can be stepped up substantially, the premium can be eliminated.

It is believed that through the GM experiment, Chevrolet hopes to discover whether the complaints are real or imagined. Unmarked nylon tires will be supplied by the Firestone Tire & Rubber Co., General Tire & Rubber Co., B. F. Goodrich Co., and the U. S. Rubber Co., reportedly at rayon tire prices. Chevrolet will keep track of automobile serial numbers in order to check owner reaction and presumably will also check complaints filtering back through company dealers.

Nylon producers, expecting a major break-through into the tire cord market for some time, have sharply boosted their cord making capacity. Chemstrand Corp. has increased nylon producing capacity at its Pensacola, Fla., plant from 50 million pounds to 114 million pounds annually, while DuPont recently completed a fourth nylon plant with a 35 million pound capacity at Richmond, Va.

Rayon producers state that the experiment "has several aspects of a loaded test". They believe the unmarked tires will result in confusion with consumers blaming rayon tire cord for the noise, flat-spotting and shorter tread life now attributed to nylon cord tires. However, they are not convinced that the experiments will vindicate nylon, and one big rayon manufacturer, Industrial Rayon Corp., believes the experiment "will reaffirm rayon's advantages."

These tests follow on the heels of publicity from nylon producers aimed at down-grading rayon. DuPont has publicized laboratory tests which, it claims, show that nylon cord is far superior to rayon in resisting heat generated by high-speed turnpike driving. In another DuPont test, a 4½ inch spike was driven into revolving nylon and rayon cord tires to a depth of 2½ inches. It was reported that the rayon tire failed after anywhere from 8,200 to 54,800 jabs, compared with from 197,200 to 1,186,000 impacts before the nylon cord tire blew out.

Rayon producers have also been launching a publicity campaign. Last year, American Viscose sponsored a big game hunting trip in which two trucks and a jeep equipped with rayon cord tires were driven through Africa. It was reported that rayon "was more than equal to the worst terrain of roadless back-country Africa." Viscose and other rayon producers contend that if rayon cord tires can take this kind of punishment, they are strong enough for the average motorist. They believe that nylon's allegedly greater protection against blowouts is not needed under ordinary driving conditions. The American Rayon Institute has also reported that tests conducted by Lewis S. Goodfriend Associates of Scarsdale, N. Y., indicated nylon cord tires were 10 to 33 per cent noisier on the road than rayon.

Austin Goodyear — Thomas Robins, Jr.

Hewitt-Robins Names New President

► Austin Goodyear, executive vice-president of Hewitt-Robins, Inc., Stamford, Conn., has been elected president of the company succeeding Thomas Robins, Jr., who will continue as chairman of the board and chief executive officer. Mr. Goodyear was born in Buffalo, N. Y., and was educated at Nichols School there. Later, he attended St. Mark's School in Southboro, Mass., and Yale University. Before joining Hewitt-Robins, he was briefly associated with the banking firm of Brown Bros. Harriman & Co., New York, and the Bullard Machine Tool Co., Bridgeport, Conn. He joined Hewitt-Robins in 1941 serving in the Manufacturing Department at the company's Passaic, N. J., plant. In 1943, he joined the U. S. Air Force and returned in 1945.

Mr. Goodyear was appointed production manager in 1947 and was transferred from production to sales in 1948 as assistant to the vice-president in charge of sales. He was elected to the board of directors in 1952, a vice-president in 1953 and was named executive vice-president in 1955. Mr. Robins' career with the company dates back to 1919, when he was a field serviceman for the Robins Conveying Belt Co., which had been founded in 1896 by his father Thomas Robins. He became president of the firm 22 years ago and has been serving in the dual capacity of president and board chairman. He organized the American Synthetic Rubber Corp. and is a member of the U. S. State Department Advisory Panel on international rubber matters.

Becomes Appleton Machine Division

► Doven Machine and Engineering, Inc., Chicago, Ill., has become a division of the Appleton Machine Co., Appleton, Wisc., due to the growing demand for the company's products and the lack of facilities or capital to handle increasing needs. Eugene Doven will continue as vice-president in charge of the Doven Division at Appleton, Wisc. Appleton Machine was founded in 1883 and has large facilities with a present man power of approximately 250.

Goodrich and Dayton Rubber Terminate Sponge Agreements

► A government anti-trust suit against the B. F. Goodrich Co. of Akron, Ohio, and the Dayton Rubber Co. of Dayton, Ohio, in which the companies were charged with violation of the Sherman Anti-Trust Act in the manufacture and sale of sponge rubber, was terminated in a consent judgment on March 31 in Federal Court in New York City. The government complaint, filed shortly before the consent judgment was signed, had charged that agreements entered into by the two companies restrained trade in the manufacture and sale of sponge rubber on the world market.

The complaint named as co-defendants two companies and two individuals known as the "English Group", who were engaged in the acquisition and licensing of sponge rubber and allied product patents on a world wide basis. The defendants were identified as Josef Anton Talalay, a resident of New Haven, Conn., and inventor of a foam-freezing process; the Moulded Hair Co., Ltd., London; the Hairlock Co., Inc., a Delaware corporation which is now dissolved, and Joseph Arthur Howard, a director of Moulded Hair with offices in London. Goodrich became a party to the alleged conspiracy, said to have started in 1938, by its purchase of the Sponge Rubber Products Co. in 1954, the government said.

"Inherited" Agreements

A spokesman for Goodrich in Akron said the agreements cited by the Justice Department were not made by Goodrich but were "inherited" by the firm. Goodrich initiated the action to curtail the agreements in line with Justice Department policy, the spokesman said, adding that the Justice Department had reneged on a pledge it made to call attention to the fact that the agreements were made by Sponge Rubber "years ago".

The government, in its suit, charged that the defendants had conspired with the English group to allocate world markets for the manufacture and sale of chemically blown sponge rubber and to prevent the entry of domestic competitors into the rubber market. The defendants were enjoined from allocating world markets and also from engaging in joint action to prevent competitors from entering this field and to determine who shall be licensed in the United States to manufacture and sell sponge rubber products under the patents of the defendants and the English group.

Other provisions required the defendants to grant licenses under specified patents to all applicants upon conditions at least as favorable as those in any license agreement to any third person. Victor R. Hansen, assistant attorney general said: "This judgment will open up this field to other prospective manufacturers of sponge rubber. The new competition will bring to the public the benefits which it has a right to expect in a free enterprise society."

S. M. Cadwell Retires From U. S. Rubber

► U.S. Rubber Co., New York, N. Y., has announced the retirement of Dr. Sidney Marsh Cadwell as director of research and development. (An article on Dr. Cadwell's successor, Dr. L. M. White, appears elsewhere in this issue). Associated with the U. S. Rubber Co. for 39 years, Dr. Cadwell has won distinction in the rubber industry through his contributions to research and development and his active affiliation with technical societies.

Dr. S. M. Cadwell

Born in Boseman, Montana, Dr. Cadwell received his early schooling in Alameda and Bakersfield, Calif., and Kingston, N. Y. He attended the University of Chicago, receiving a B.S. degree in 1914 and a Ph.D. in 1917. During World War I, he was a captain in the U. S. Army, serving as technical aide to the director of the Chemical Warfare Service.

Dr. Cadwell joined U. S. Rubber in 1919 as a research chemist in the general laboratories, and in 1930, after 11 years of rubber and chemical research, he became assistant director there. Soon afterwards, he was named director of tire development with headquarters in Detroit. In 1945, Dr. Cadwell was appointed assistant general manager of the Tire Division with responsibility for production, development and service at the company's five major tire and tube plants and on June 1, 1946, he was appointed to his most recent position as director of research, with headquarters in New York.

Dr. Cadwell, who has contributed much to the scientific advancement of rubber, has 69 patents, including patents on the development of improved antioxidants. His name is on most golf balls because of his part in the development of the Cadwell cover to resist cuts and slices. During World War II, he did notable work in the development of synthetic materials and was among the first to recognize the value of butyl rubber for inner tubes and the advantage of using rayon cord in synthetic rubber tires. Dr. Cadwell was also first to promote the use of rayon cord in butadiene-styrene truck tires. He was successively director, vice-president and chairman of the War Activities Committee and president of the Tire and Rim Association during the war years.

Dr. Cadwell has served as chairman of the Division of Rubber Chemistry of the American Chemical Society and chairman of the Detroit section of the American Chemical Society. He is also a member of the Society of Automotive Engineers and the American Institute of Chemical Engineers. In September, 1956, he was awarded the Charles Goodyear Medal by the Rubber Division of A. C. S. for his outstanding contributions to rubber technology. Along with his active participation in the rubber industry, Dr. Cadwell has maintained an interest in many civic and social organizations.

Food Machinery and Chemical Reorganizes Operations

► In a move to streamline the organization of its chemical operations, Food Machinery and Chemical Corp. of New York, N. Y. has created the Organic Chemicals Department and the Inorganic Chemicals Department and has enlarged its Executive Committee. Alfred T. Loeffler, FMC vice-president, has been named general manager of the new Organic Chemicals Department, which includes the Niagara Chemical Division and the Chemicals and Plastics Division, formerly the Organic Chemicals Division. Mr. Loeffler will be assisted by R. H. F. Dade, who has been named a vice-president of the Chemical Divisions. Frederick A. Gilbert has been named manager of the Inorganic Chemicals Department, which comprises the Becco Chemical Division, the Westvaco Chlor-Alkali Division, and the Westvaco Mineral Products Divisions. Donald C. Oskin will be assistant general manager under Mr. Gilbert, and has been named a vice-president of the Chemical Divisions.

The Chemical Divisions' Executive Committee, which has management responsibility over all the Chemical Divisions, has been enlarged and strengthened by including Jackson V. Vernon, William N. Williams and J. D. Fennebresque, FMC vice-presidents; and Dr. Emil Ott, Director of Research and Development. They will serve with Dr. Carl F. Prutton, FMC executive vice-president, on the committee, which also includes Bernard H. Jacobson, Frederick A. Gilbert, and Alfred T. Loeffler.

Rubber Irradiation Discussed At Atomic Energy Conference

► The general effects of ionizing radiation on rubbers, plastics, fibers and resins were discussed by Robert B. Mesrobian, associate director of research for the Central Research and Engineering Division of the Continental Can Co., during a session on "Potential Application for Large Sources of Radiation", at the Atomic Energy Management Conference. Co-sponsored by the National Industrial Conference Board and the Atomic Industrial Forum, the conference was held March 17 to 19 at the Palmer House in Chicago, Ill.

In his talk, Mr. Mesrobian stated that irradiation can be used to vulcanize rubber and to create useful new chemicals known as "graft" copolymers. He continued to say, "The irradiation of polymers by gamma- or x-rays in the presence of common vinyl monomers results in the formation of "graft" copolymers wherein the monomer component is chemically combined or grafted to the backbone of the starting polymer. A number of unique radiation induced graft copolymer systems have been developed which manifest useful properties. These include: (1) polyethylene containing grafted vinyl carbasole to produce a heat resistant dielectric material; (2) silicone rubber containing up to 34% acrylonitrile to improve oil resistance of the elastomer; (3) Teflon containing surface grafting or styrene to improve adhesion to surfaces; (4) cation and anion exchange resins derived by grafting vinyl pyridine to polyethylene or styrene to polyethylene followed by introduction of sulfonic acid or quarternary amine groups to the styrene units. In the latter case, the ion exchange resins are used as permeaselective membranes for removal of salt from brackish water and sea water by the method of multiple membrane electrodialysis. Data are presented on the properties of the above-mentioned systems as well as the conditions and mechanisms for inducing radiation grafting.

Curing Unsaturated Polymers

"Concerning the vulcanization of unsaturated polymers such as natural and synthetic rubbers by gamma-rays, it is generally found that in the absence of any added organic reagents a dosage on the order of 30 Megarads is required to effect complete vulcanization of the network chains. In the presense of monomeric materials such as para-chlorostyrene, however, the required dosage to effect gelation can be reduced to 1.05 Megarads. The profound increase in efficiency of radiation vulcanization is attributed to several factors which include an increased average lifetime of radicals in the rubber system by chain transfer to monomer and subsequent interaction of growing chains with segments of the rubber molecule. These are important factors to bear in mind in considering the efficiency and over-all economics of radiation induced processes," the speaker declared.

James N. Mason

John M. Bierer

Mason Succeeds Bierer at BWH

► James N. Mason, formerly executive vice-president of the Boston Woven Hose & Rubber Co., a division of the American Biltrite Rubber Co., Inc. at Cambridge, Mass., has been elected president and general manager of the company succeeding John M. Bierer, who has retired. Born in Brockton, Mass. Mr. Mason attended Bowdoin College in Brunswick, Maine. His father, Herbert T. Mason, was president of the Quabaug Rubber Co. where the son served as plant manager from 1931 to 1941. During 1941-42, he was plant superintendent of the Victor Reclaim Products Corp. Mr. Mason was associated with the O'Sullivan Rubber Corp. of Winchester, Va. and the Inter-chemical Corp. of New York, N. Y. before coming to Boston Woven Hose & Rubber Co. to organize and head its Research and Development Department in 1953. He was subsequently elected vice-president in charge of manufacturing and development, and in 1954 was elected a director of the company and executive vice-president in 1955. In 1957, following the merger of Boston Woven Hose with American Biltrite, he was elected a director and vice-president of Biltrite.

Mr. Bierer, at the request of the board of directors, has agreed to continue as a director and vice-president of Biltrite, devoting his time and efforts to improving the "Rotocure" machine and to promoting its world wide sale. A graduate of Washington and Lee and Massachusetts Institute of Technology, Mr. Bierer served one year as an instructor at M.I.T. before coming to Boston Woven Hose & Rubber in 1911 as a chemist. Mr. Bierer's contributions to the rubber industry include serving as chairman of the Division of Rubber Chemistry, American Chemical Society, and as Fellow of the Institution of the Rubber Industry, England. He has been issued many patents pertaining to the continuous vulcanization of rubber products, now widely known as the Rotocure process. After relinquishing his duties as president, Mr. Bierer plans to depart on a business trip which will include visits to the many Rotocure users around the world.

Sindar Moves Central Offices

► Sindar Corp. has announced that effective May 19, the company's executive and sales offices and service laboratories will be located at 321 W. 44th St., New York 36, N. Y. The new telephone number is Circle 5-0310. Sindar's new facilities include larger service laboratories equipped with the most modern apparatus available. The company's previous location was 330 W. 42nd St., New York 36, N. Y.

► "Propionic Acid; F-40, 161A" is a new 4 page bulletin on propionic acid released by Union Carbide Chemicals Co., 30 E. 42nd St., New York, N. Y., which includes data on physical properties, specifications, shipping data and applications.

Goodyear Nylon Truck Tire

► Goodyear Tire and Rubber Co., Akron, Ohio, has announced the development of a new special purpose nylon tire designed to give improved service in heavy truck usage. The tire is adapted for use on front wheels of trucks in which the axle is heavily loaded and short turns with power steering are common, such as concrete ready-mix trucks and high volume stone and gravel haulers. Named the "FWT-2", the new tire has three wide ribs to resist edge tearing, and a tread radius which gives good forward and lateral traction. The design is said to reduce the tendency for stones to catch in tread grooves and cleaning edges. The FWT-2 tires with Xtra Tread non-skid depth, are available in two sizes: 10.00-20, 12-ply rating, and 10.00-22, 12-ply rating with standard tread depth.

Symposium on New Elastomers Features New York Group Meeting

► Approximately 240 members and guests attended the March 28 dinner meeting of the New York Rubber Group held at the Henry Hudson Hotel, New York, N. Y. The meeting featured a "Symposium on New Elastomers" dealing with recent technical advances in elastomeric compounds and processes. A cocktail hour and dinner followed the technical session and the evening was concluded with an unusual talk by Dr. Eugene W. Boehne, Professor of Chemical Engineering, Massachusetts Institute of Technology, who spoke on "Nature, Art and Arithmetic," the manner in which life forces can be reduced to simple mathematical relationships.

The first paper presented at the symposium was entitled "Properties of Cis-Polybutadiene," by H. E. Railsback (Phillips Petroleum). Mr. Railsback noted that the development of stereospecific catalysts has provided a number of new synthetic elastomers including *cis-* and *trans*-polyisoprenes, *cis-* and *trans*-polybutadienes, and various other polymers and copolymers of controlled structure. Although much attention has been given to the production of *cis*-polyisoprene (synthetic natural rubber) by such processes, equally interesting and perhaps commercially more significant, are products of the orderly polymers of butadiene.

Describes Orderly Polymer

Mr. Railsback described the properties of one of the orderly polymers of butadiene, a material of about 94.5 percent *cis*, 1.8 percent *trans* and 3.7 percent vinyl content. Carbon black reinforced vulcanizates display moderate tensile strength, low modulus and Shore hardness and excellent hysteresis properties when tightly cross-linked. Actually high *cis* configuration gives properties resembling those displayed by Hevea, in many respects, and rubbers having high *trans* configuration resemble balata or gutta percha. Rubbers with a *cis* content in the range of 70 to 80 per cent have been shown to have very low freeze point and little tendency to crystallize after conditioning for extended periods at low temperatures, he stated.

Blends of *cis*-polybutadiene with natural rubber up to a ratio of 1:1 exhibit very satisfactory milling and extrusion characteristics. The vulcanizates have good stress-strain properties at 80°F. or 200°F. Hysteresis properties are excellent, the speaker declared.

cis-Polybutadiene is readily produced in a solution polymerization process using a selected organometal catalyst, and this process is currently under study in a pilot plant program. Tire tests are underway and more extensive tests are planned. Inasmuch as *cis*-polybutadiene blends readily with natural rubber to give good processing stocks having hysteresis and resilience properties at least equal to the latter, the major potential outlet for *cis*-polybutadiene may well be for use in such mixtures.

The second paper presented at the elastomer symposium featured an address by O. C. Keplinger (General Tire) entitled "Genthane-S (Polyurethane) — Its Compounding and Properties." Mr. Keplinger stated that Genthane-S is the designation given to one of the polyurethane elastomers developed by the General Tire & Rubber Co. The recommended curing system permits the use of conventional rubber processing equipment and schedules. Products derived from this stock may be expected to show excellent resistance to hydrocarbons, some esters, ozone and oxygen coupled with an excellent balance of physical properties including good performance at low temperatures and remarkable stability at temperatures up to 300°F. Genthane-S is not recommended for use in polar fluids. Abrasion resistance is expected to be good.

The gum may be loaded with a variety of pigments. Sulfur or a small amount of absorbed moisture are the principal hazards. Channel blacks, furnace blacks, dry clay, calcium carbonate, "Hi-Sil" and "Titanox" have been incorporated in amounts up to one hundred parts per hundred of gum, the author declared.

The cure may be effected with a variety of reagents among which dicumyl peroxide is outstanding. Stocks to be cured with this material are nonscorching and may be stored for months after extruding, calendering, or milling. They cure quickly—45 minutes at 310°F. or 20 minutes at 320°F., for example—and require no after cure.

Speaks on Viton Elastomer

The last paper of the elastomer symposium was a report on "New Developments in Viton Fluorinated Elastomers," by T. D. Eubank, (Du Pont) Mr. Eubank stated that over the past decade, specialty elastomers have been advanced with much improved high temperature performance—or with excellent oil and solvent resistance. However, the development of an elastomer which combines the desirable qualities of heat and fluid resistance is comparatively recent. Viton A has resulted from research which was undertaken with the objective of producing material which would meet the need in elastomers that is met in plastics by "Teflon".

Viton is manufactured by the copolymerization of vinylidene flouride and hexaflouropropylene. This synthetic rubber has a relatively high density and is offered in low viscosity grades. For all practical purposes, it is colorless in the raw state, is soluble in ketones, and has excellent storage stability, Mr. Eubank pointed out.

Viton A was introduced about a year ago and is already becoming widely known for its excellent balance of properties. The combined resistance to heat and to the deleterious effect of many fluids, and the retention of elastomeric properties at elevated temperatures, make Viton A a unique material. In addition, Viton A can be processed on conventional rubber equipment. Work during the field evaluation year has centered on defining the limits of operability of Viton A and developing compounds that would give the best in heat and fluid resistance. Viton A compounds contain three basic elements besides the polymer: an acid acceptor, a filler, and a curing agent.

Modified Polymer Developed

A modified Viton polymer has been developed specifically for hydraulic hose, where blistering under extremes of temperature and pressure has been a problem. Viton A-HV is of inherently higher molecular weight and higher Mooney viscosity than Viton A. It should be noted that the original stress-strain properties of the Viton A-HV and those measured at 300°F. are superior to those of Viton A. The tendency to blister under conditions of hydraulic hose use is greatly minimized in the Viton A-HV compound.

The major uses for Viton thus far have been in those critical applications in aircraft and automotive fields where combined high temperature and fluid resistance are required. O-rings, shaft seals, and packings are typical applications. Excellent compression set resistance is characteristic of Viton. Also outstanding is the resistance of Viton to the diester lubricants at 400°F. Cellular sealing strips, hose, protective clothing, wire insulation, and caulking represent product areas where Viton commands growing interest.

U. S. Rubber Foreign Car Tires

► U. S. Rubber Co., New York, N. Y., has introduced a 13-inch tire, called the "U. S. Royal Safety 8" and two new 15-inch tires for the growing foreign car market. The 13-inch tire will fit 13 foreign built models, while the 15-inch tires will fit 14 other imported models. Of original equipment quality, both tires are of four-ply rayon construction and are available in tubeless and tubed form, with or without a two-inch white sidewall. They are being manufactured at the company's five tire plants in Detroit, Los Angeles, Indianapolis, Chicopee Falls, Mass., and Eau Claire, Wisc. Previously, U. S. Rubber supplied tires for foreign cars on a limited basis from stocks sent here by its British subsidiary, the North British Rubber Co., Ltd.

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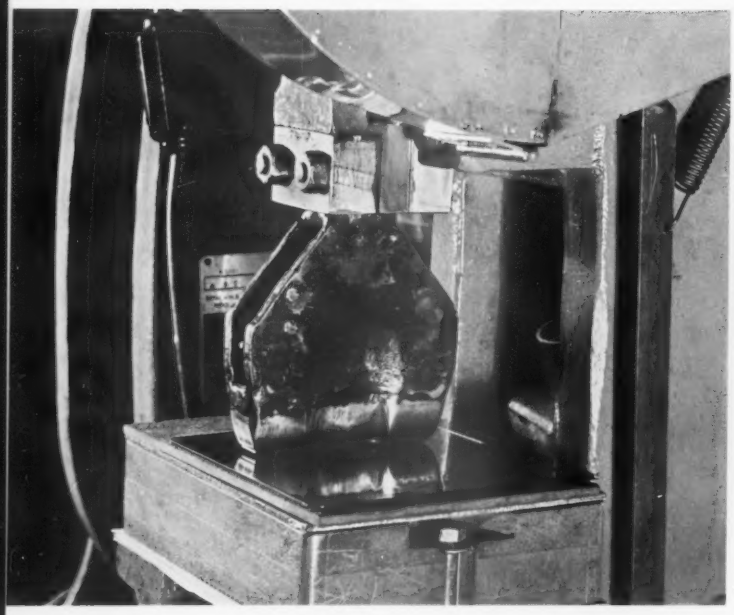

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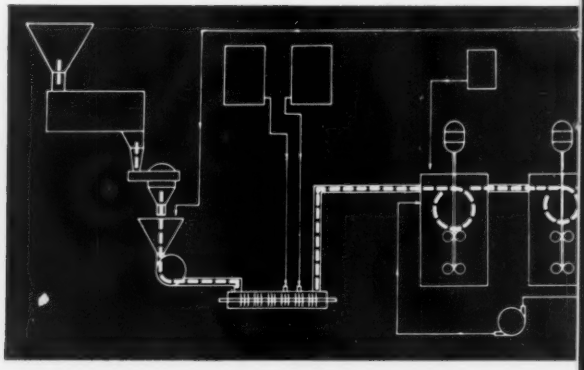

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International Rubber Meeting To Have Diversified Program

► The International Rubber Conference, sponsored jointly by the Division of Rubber Chemistry of the American Chemical Society; Committee D-11 on Rubber and Rubberlike Plastics Materials of the American Society for Testing Materials, and the Rubber and Plastics Division of the American Society of Mechanical Engineers, to be held on November 8 through 13, 1959, at the Shoreham and Sheraton Park Hotels in Washington, D. C., will have a diversified program reflecting the activities of the sponsoring organizations. It is expected that the program will include papers in the broad fields of rubber chemistry and technology, the testing of rubber and rubber products, and engineering in the rubber industry, with special reference to equipment and processes and rubber as an engineering material.

The Program Committee is soliciting papers for the Conference and has set the following deadlines: *October 1, 1958*—Title of paper, affiliation of author(s), and time required for presentation; *January 1, 1959*—Abstracts of papers (approximately 250 words); *June 1, 1959*—Completed manuscript in four copies. All correspondence with respect to the papers should be addressed to: Dr. B. S. Garvey, Jr., Chairman Program Committee, International Rubber Conference, Pennsalt Chemicals Corp., 813 Lancaster Pike, Wayne, Penna.

Papers Must Be Sponsored

Papers originating within the United States and its possessions must be sponsored by one of the three societies involved and shall meet the requirements of the sponsoring society with respect to membership of the author or authors and the quality standards of the pertinent society by its own review. Authors from outside the United States and its possessions are not required to be members of any of the American societies, and papers from overseas will be especially welcomed.

The following twelve classifications of subjects and their subclassifications are suggested to authors wishing to contribute papers to the Conference program. These classifications, however, are not intended to be restrictive. Papers not falling directly under any of these classifications will be welcomed for consideration. The classifications are:

1—Equipment and Processes in Rubber Manufacturing: (a) Automation; (b) New Equipment; (c) New Processes.

2—Elastomers as Engineering Materials: (a) Vibration Dampers; (b) Sealants; (c) Materials Handling.

3—Advances in Test Methods: (a) Small Scale Testing; (b) Deterioration Tests; (c) Tests of Dynamic Properties; (d) Control Tests.

4—Product Testing: (a) Tires; (b) Belting and Other Mechanical Products; (c) Foam and Sponge Rubber.

5—Statistical Methods in the Rubber Industry; (a) In Research and Development; (b) In Testing; (c) In Production.

6—Nomenclature and Classification; (a) General Terms; (b) Elastomers and Compounds; (c) Processes and Products.

7—New Developments in Elastomer Reinforcement: (a) Carbon Blacks; (b) Mineral Products; (c) Resins.

8—Compounding Developments: (a) Vulcanization; (b) Rubber Chemicals; (c) Special Applications.

9—Polymers and Polymer Structure: (a) Stereospecific Elastomers; (b) Polyurethane Elastomers; (c) Elastomers for High Temperature Use.

10—Production of Rubber: (a) Plantation Practices; (b) Synthetic Rubber Production; (c) Elastomer Manufacture.

11—Latex Technology and Foam Products: (a) Dipped, Extruded and Spread Goods; (b) Foamed Rubber; (c) Foamed Elastomers.

12—Physics and Rheology of Rubber: (a) Viscosity and Flow Phenomena; (b) Elasticity, Time, Temperature and Frequency Effects; (c) Optical, Electrical and Other Physical Properties.

The Program Committee urges members of the sponsoring societies and other interested persons throughout the world to begin now to plan for the International Rubber Conference. By November, 1959, five years will have elapsed since the Third Rubber Technology Conference of the Institution of the Rubber Industry. The many advances in rubber science, technology and engineering occurring during this period should be covered at the International Conference.

Dates and Facts to Remember About the International Rubber Conference

Date of Meeting:	November 8-13, 1959
Place of Meeting:	Shoreham and Sheraton Plaza Hotels, Washington, D. C.
Title of Papers:	Must be submitted by October 1, 1958, together with affiliation of author(s) and time required for presentation.
Abstracts of Papers:	Must be submitted by January 1, 1959 (approximately 250 words).
Complete Manuscripts:	Must be submitted in four copies by June 1, 1959
Whom to Contact:	Address all correspondence, abstracts, papers, etc., to Dr. B. S. Garvey, Jr., Chairman Program Committee, International Rubber Conference, Pennsalt Chemicals Corp., 813 Lancaster Pike, Wayne, Penna.

► "Specifications and Characteristics of Fatty Acids", a section of the "Emeryfacts" series, has been offered by the Fatty Acid Sales Department of Emery Industries, Inc., Dept. 5, Carew Tower, Cincinnati 2, Ohio.

Sun Rubber Plans Merger

► Sun Rubber Co., Barberton, Ohio, is reported to be negotiating a merger to strengthen its sales and working capital position. Until negotiations progress further, however, Sun officials said they were unable to disclose details. The company told suppliers and others in a letter on April 17 that it had made exceptionally large expenditures for machinery and other improvements necessary to handle new rubber and vinyl products. Sun stated that prospects are excellent for future sales growth in these fields. So far this year, acceptance of the firm's new housewares and automobile mats has been good and there has been encouraging sales interest in new dolls, toys and athletic balls, the company reported. Operations were cut back sharply early this year and employment is now limited to key office and plant employes.

Produces Tires For Foreign Cars

► Goodyear Tire & Rubber Co., Akron, Ohio, has announced an increase in the production of tires for the rapidly expanding foreign car market. Goodyear states that approximately 93 per cent of automobiles now being imported into the United States can be fitted from a selection of ten sizes of tires currently in production. The company is manufacturing and warehousing its tubeless "Custom Super Cushion" tire, with black or white sidewall, on a nationwide basis at a rate four times greater than that of last year. Tire sizes are 5.20-13, 5.60-13, 5.90-13, 6.40-13, 5.00/5.20-14, 5.60-15, 5.90-15 and 6.00-16. Sizes 6.00-16 and 5.90-15 and they fit American-made as well as imported vehicles.

MAN IN THE NEWS

LELAND M. WHITE

► Dr. Leland M. White, the newly appointed successor to Dr. Sidney M. Cadwell as director of research and development for the U.S. Rubber Co., was born on December 21, 1914, in Louisburg, Kansas. After completing elementary and secondary schooling in Louisburg, he obtained a B.S. degree in chemistry from Ottawa University in Ottawa, Kansas. He continued his studies in physical and organic chemistry and physics at the University of Kansas where he obtained his Ph.D. degree in 1940.

Immediately after finishing his schooling, he joined the General Laboratories of U.S. Rubber as a research chemist, where his first assignment was synthetic rubber development. In 1945, Dr. White was appointed a research group leader, supervising work on the utilization of synthetic rubber. During this period he developed a process for making specialty types of synthetic rubber for use by the wire and cable industry. He also did basic research on cold rubber, carbon black masterbatches, easy processing synthetic rubbers and initial work on a family of rubber-resin plastics in wide use today.

In 1948, Dr. White was appointed head of the Research Department working on applications for synthetic rubber. Five years later he became assistant director of research and development for the company, a post he held until his most recent advancement.

Dr. White is a member of Sigma Xi, the national honorary scientific society,

and is active in the American Chemical Society. He resides in Nutley, N. J., with his wife and two daughters. In the relatively short time he has been with U.S. Rubber, Dr. White has risen to hold one of the top research positions in the industry, a noteworthy mark of his abilities. Not yet forty-four years old, much fruitful work can be expected of Dr. White in the years that lie ahead.

Appointed Sales Representative

► Industrial Chemicals Division of the Pittsburgh Coke and Chemical Co., Pittsburgh, Penna., has announced the appointment of Donald L. McCuen as a sales representative handling the company's industrial chemicals in the Philadelphia territory. He succeeds Walter H. Daub, who has been transferred to Pittsburgh on an assignment to the Product Development Section of the Industrial Chemicals Division. Before joining Pittsburgh Coke, Mr. McCuen was a technical representative for the Polymer Chemicals Division of W. R. Grace & Co., and had been president of his own manufacturing firm, McCuen Products, Inc. He also served as consultant to the Southwestern Research Corp., and was a technical representative with the Naugatuck Chemical Division of the U. S. Rubber Co. He was graduated from Princeton University in 1951, receiving a B. S. degree in chemical engineering. Mr. McCuen is a member of the American Institute of Chemical Engineers, the Society of Plastics Engineers and the American Chemical Society. He is also a World War II veteran.

Ramflex For Asphalt Pavings

► U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y., has developed a free-flowing, devulcanized rubber called "Ramflex" to be used in combination with asphalt for highway and general paving applications. Field-tested for six years on highly trafficked roads, Ramflex is said to have imparted increased structural stability to asphaltic type pavements. According to the company, Ramflex is ideal as a surface course for new pavements and is also suitable for providing a tighter, longer lasting hot patch for crumbled pavements. In cold weather, the material reduces brittleness and increases impact resistance, while in hot weather this rubber material reduces the softness of pavement. Because a rubber-asphalt combination has less tendency to flow, "bleeding" at high temperatures is minimized. Under all temperature conditions, adhesion of the asphalt to the aggregate is said to be improved. Ramflex, which can be added directly to the aggregate in pug mills without specialized equipment, permits application in a conventional spreader and closer rolling to the spreader.

American Cyanamid Names Two

► The Rubber Chemicals Manufacturing Department of the Organic Chemicals Division, American Cyanamid Co., Bound Brook, N. J., has announced the appointment of W. A. Weber as manager of plant services while Stuart Whitehead has been named manager of the department. Mr. Weber, formerly chief plant engineer, now heads a services department that primarily includes engineering, utilities, and maintenance-construction activities of the plant. A veteran of 34 years with Cyanamid, Mr. Weber joined the company as a draftsman. In recent years he has assisted in constructing new plants at Willow Island, West Va., and Savannah, Ga. A graduate of Rutgers University, he is a member of the Raritan Valley Society of Professional Engineers, the National Society of Professional Engineers and the Society for the Advancement of Management. Mr. Whitehead joined the Bound Brook plant of Cyanamid in 1946 as area maintenance superintendent. He has been manager of the plant's services department since 1957. A graduate of Ohio State University, he is a charter member of the American Institute of Plant Engineers.

Fort Wayne Hears Keplinger

► The April 10 dinner-meeting of the Fort Wayne Rubber and Plastics Group, held at the Van Orman Hotel in Fort Wayne, Ind., featured an election of officers and an address by O. C. Keplinger (General Tire) on "Genthane-S (Polyurethane)—Its Compounding and Properties." Approximately 180 members attended the smorgasbord dinner and election meeting. The new officers for the 1958-59 season are: *Chairman*, Phil Magner, Jr. (General Tire); *Vice-Chairman*, Walton Wilson (R. T. Vanderbilt), and *Secretary-Treasurer*, Al C. Bluestine (Anaconda Wire). Newly elected directors are: R. C. Knapp (U. S. Rubber), R. K. Mack (Western Rubber), J. B. Porter (Muehlstein), and S. D. Shaw (Witco). Installation ceremonies for the new officers will take place June 7. Mr. Keplinger's address was similar to that delivered before the March 28 meeting of the New York Rubber Group, a full report on which appears elsewhere in this issue.

Wyandotte PPG 2000 Polyether

► Development of "Polypropylene Glycol 2000" as a new addition to its line of urethane-grade polyethers, has been announced by the Wyandotte Chemical Co. of Wyandotte, Mich. Enabling customers to obtain properties tailored to individual product requirements, PPG 2000 has low, uniform water content, low volatiles and ash content, good color, and low terminal unsaturation, the company states. Said to meet the strictest industry specifications, PPG 2000 will produce flexible foams with low compression set, high tensile elongation and resiliency, whether it is used alone or in conjunction with other polyols and additives. It is available for immediate shipment in tank car quantities.

M. W. Laibe

O. E. Miles

Victor Holt, Jr.

C. C. Gibson

S. DuPree

Five Executives Advanced by Goodyear

► Victor Holt, Jr., formerly vice-president in charge of sales of the Goodyear Tire & Rubber Co., Akron, Ohio, has been elected executive vice-president of the company while C. C. Gibson, O. E. Miles, Sam DuPree and M. W. Laibe have been appointed vice-presidents. Mr. Holt succeeds R. S. Wilson who retired recently. A graduate of the University of Oklahoma, Mr. Holt joined the Goodyear organization in 1929. He became a vice-president and a member of the Executive Operating Committee in 1946 and was named to the board of directors in January of this year.

Mr. Gibson has been vice-president of the Automotive Products sales Division and is responsible for original equipment sales to automotive manufacturers. He started with Goodyear in 1937 as a sales trainee following graduation from Harvard University, and a year later became a general line salesman. Mr. Gibson became Northeast Division manager in 1952 and was named manager of the Manufacturers Sales Department and elected a vice-president of the sales company in April 1956.

Mr. Miles has been vice-president of the replacement trade sales division and was formerly sales manager, Tire Division. He joined Goodyear in 1932 at Akron on the sales training squad. Mr. Miles was named general manager of the Retail Store Division in 1954, and sales manager, Tire Division, in 1956.

Mr. DuPree has been vice-president of the general products sales group and will continue supervision in that area, serving as liaison executive with the company's other-than-tire divisions. He joined Goodyear on the production training squad in 1934 following graduation from Georgia Tech. Mr. DuPree was named assistant to the vice-president in charge of sales in 1953 and promoted to general manager, Industrial Products Division, a year later. Appointment as a vice-president of the general products sales group came in February 1957.

Mr. Laibe, former director of purchases and more recently assistant to Goodyear President E. J. Thomas, heads up all purchasing, general merchandise and material control, traffic, warehousing and rubber plantations. He joined Goodyear in 1925 following graduation from Ohio State University. Promoted to director of purchases in 1952, he was named as assistant to Mr. Thomas in February of this year.

Tire Pressure Tempering Process

► U. S. Rubber Co., New York, N. Y., has developed a new method of processing nylon passenger tires called "Pressure Tempering", which is said to eliminate growth in service and to decrease tread-groove cracking. The new process also increases the mileage of tires made with nylon cord and gives them more dependable performance at turnpike speeds, the company states. The pressure tempering process takes the stretch out of nylon tire cord and rubber compounds by inflating the tire on a specially-designed wheel immediately after the tire is removed from the vulcanizing mold. The tire, kept inflated at a high pressure while it continues to cure and cool, is stretched to larger dimensions than the mold. The company says that this process removes internal stresses and strains and allows the cure to be completed with all parts of the tire in the exact configuration they will occupy in service. The result is that tread, sidewalls and carcass are free of cured-in strains and can work in harmony. Pressure tempering is being used on the company's entire line of nylon passenger tires, including a new replacement tire, the "U. S. Royal DeLuxe."

Styrene Facility on Stream

► A new butadiene styrene plant that will triple the capacity of its Illiopolis, Ill., manufacturing operations has been brought on stream by the Borden Co. according to Augustine R. Marusi, president of the company's Chemical Division. The new plant, which replaced outmoded facilities used at the Illinois location since the early 1950's went into operation at the same time Borden's announced the addition of 8 glass-lined, 6,000-gallon, double-compartment chemical tank cars to its railway transportation fleet. Output of the highly automated plant will be devoted primarily to the company's "Polyco 2421", a binder used in pigmented clay coatings for high-grade paper.

"The new plant not only will triple capacity, but it also will give us better quality control and uniformity," Robert M. Austin, the Illiopolis plant superintendent said. "This results from automatic metering, automatically controlled feeds, and other technological advances incorporated in the new plant's design." Borden's Illiopolis operation is not limited to the manufacture of butadiene styrene, Mr. Austin said. A full line of Borden chemicals are produced at the facility.

Valpey Elected President

► Standard Products Co., Cleveland, Ohio, has announced the election of F. Russell Valpey, formerly senior vice-president and chairman of the management policy committee, as president. He succeeds Dr. James S. Reid, founder of the company, who has been serving both as chairman and president, and who will continue as chairman and chief executive officer. Mr. Valpey started his career with the National Cash Register Co., Dayton, Ohio. Before joining Standard Products, he had been associated with Willys-Overland as New York representative; the Graham Brothers Truck Co. as sales manager; Dodge Motors as general sales manager in charge of truck sales, and Graham-Paige Motors as vice-president and director. He joined Standard Products in 1940 as Washington representative and has served the company as secretary; manager of the Port Clinton, Ohio, Division; general manager, and vice-president. Mr. Valpey is a director of the Michigan Post of the American Ordnance Association, a member of the association's National Rifle and Carbine Committee and an adviser to the government's Small Business Administration.

Rubber Manufacturing Industry Plant Vacation Schedules

As a service to the rubber industry and its suppliers, there appears below a listing of those companies which have announced vacation schedules during which time the plants will close. It may be said, however, that many of the companies involved will maintain standby staffs during the period. The dates appearing after each company name may or may not be inclusive and appear as reported by the individual concerns. Where more than one plant is involved, the listing will so state. The listings are, of course, published for guidance only.

United States

AA Patch Co., Inc., Holyoke, Mass. (June 27-July 7).
Acadia Synthetic Products, Division of Western Felt Works, Chicago, Ill. (July 21-Aug. 3).
Accurate Insulated Wire Corp., New Haven, Conn. (June 28-July 14).
Accurate Mfg. Co., Garfield, N. J. (July 3-July 21).
Ace Rubber Products, Inc., Akron, Ohio (June 30-July 12); Cuyahoga Falls, Ohio (June 30-July 6).
Acme Backing Corp., Stamford, Conn. (July 3-July 21).
Acme-Hamilton Mfg. Corp., Trenton, N. J. (Acme Division July 13-July 27); (Hamilton Division July 27-August 10).
Acushnet Process Co., New Bedford, Mass. (June 30-July 14).
A'G'A Division, Elastic Stop Nut Corp. of America, Elizabeth, N. J. (Aug. 2-Aug. 18).
Ajax Comb Co., Division of Vulcanized Rubber & Plastics Co., Morrisville, Penna. (July 21-Aug. 4).
Alco Oil & Chemical Corp., Philadelphia, Penna. (June 27-July 8).
Aldan Rubber Co., Philadelphia, Penna. (June 30-July 14).
Aldan Rug Mills, Lenni Mills, Penna. (June 27-July 13).
Alphaduct Wire & Cable Co., New Brunswick, N. J. (June 30-July 14).
American Container Corp., Huntington, West Va. (June 9-June 20); Rock Island, Ill. (June 23-July 4).
American Finish & Chemical Co., Chelsea, Mass. (June 27-July 7).
American Hard Rubber Co., Butler, N. J. (July 4-July 20).
American Rubber Corp., Albertville, Ala. (June 30-July 13).
American Rubber Products Corp., La Porte, Ind. (July 1-July 14).
Ames Rubber Co., Hamburg, N. J. (July 3-July 21).
Andrews-Alderfer Div., Kendall Co., Akron, Ohio (July 3-July 20).
Angier Adhesives, Cambridge, Mass. (June 27-July 15).
Apex Molded Products Co., Philadelphia, Penna. (July 21-Aug. 4).
Armstrong Rubber Co., West Haven, Conn. (Aug. 18-Sept. 1).
Armstrong Rubber Mfg. Co., Des Moines, Iowa (Aug. 18-Sept. 1).
Armstrong Tire & Rubber Co., Natchez, Miss. (June 30-July 6).
Arno Adhesive Tapes, Inc., Michigan City, Ind. (July 7-July 19 and Aug. 4-Aug. 16).
Auburn Rubber Co., Inc., Auburn, Ind. (June 28-July 14).
Avon Sole Co., Avon, Mass. (June 28-July 6).

Baltic Rubber & Plastics Inc., Baltic, Ohio (July 1-July 14).
Bardon Rubber Co., Inc., Union Grove, Wisc. (June 27-July 7).
Barr Rubber Products Co., Sandusky, Ohio (June 28-July 7).
Bata Shoe Co., Inc., Belcamp, Md. (June 27-July 13).
Bauer & Black Div., Kendall Co., Chicago, Ill. (June 28-July 14—Office and shipping open).
Baxter Laboratories, Inc., Cleveland, Miss. (July 19-Aug. 4).
Bay Division, Parke, Davis & Co., Bridgeport, Conn. (July 14-July 28).
B. B. Chemical Co., South Middleton, Mass. (July 3-July 21).
Bell Rubber Co., Dallas, Texas (July 3-July 14).
Berea Rubber Co., Berea, Ky. (July 1-July 15).
Bergen Cable & Rubber Co., Little Falls, N. J. (July 19-Aug. 4).
Sam'l. Bingham's Son Mfg. Co., Chicago, Ill. (June 28-July 12).
Bloomingdale Rubber Co., Chester, Penna. (July 4-July 25).
Borden Chemical Co., Peabody, Mass. (June 28-July 6); Middlesex, N. J. (June 28-July 6).
Boston Insulated Wire & Cable Co., Boston, Mass. (July 26-Aug. 10).
Boston Woven Hose & Rubber Co., Boston, Mass. (June 27-July 14).
Bowes "Seal Fast" Corp., Indianapolis, Ind. (June 30-July 14).
Bowling Green Rubber Co., Toledo, Ohio (Aug. 4-Aug. 15).
Bristol Mfg. Corp., Bristol, R. I. (July 19-Aug. 3).
Arthur S. Brown Mfg. Co., Tilton, N. H. (June 27-July 14).
Brown Rubber Co., Inc., Lafayette, Ind. (June 30-July 14).
Brunswick-Balke-Collender Co., Muskegon, Mich. (June 28-July 13).
Buxbaum Co., Canton, Ohio (July 3-July 21).

Cambridge Rubber Co., Taneytown, Md. (June 30-July 14).
Carr Mfg. Corp., Bristol, R. I. (June 27-July 14).
Carroll Shoe Co., Littlestown, Penna. (June 30-July 14).
Cartex Corp., Morrisville, Penna. (July 3-July 21).
Cementex Co., Inc., New York, N. Y. (July 4-July 14).
Champion Rubber Co., Barberton, Ohio (June 28-July 6).
Chardon Rubber Co., Chardon, Ohio (June 30-July 7).
Chemical Products, Inc., Detroit, Mich. (July 25-Aug. 11).
Chemical Rubber Products, Inc., Beacon, N. Y. (July 3-July 21).
C. F. Church, Division of American-Standard, Monson, Mass. (June 30-July 11).
Clevite Harris Products, Inc., Cleveland, Milan, and Napoleon, Ohio (July 21-Aug. 4).
Clifton Adhesive Co., Clifton, N. J. (July 4-July 14).
Coated Products Corp., Lowell, Mass. (June 30-July 6).
Coliyer Insulated Wire Co., Pawtucket, R. I. (June 29-July 12).
Colonial Rubber Co., Ravenna, Ohio (July 7-July 21).
Columbia Combining Co., Inc., Brooklyn, N. Y. (June 30-July 4 and Dec. 22-Dec. 26).
Comar Products, Inc., Butler, N. J. (July 3-July 21).
Compo Shoe Machinery Corp., Waltham, Mass. (June 30-July 11).
Continental Rubber Works, Erie, Penna. (June 30-July 14).
Cords, Ltd., Division of Essex Wire Corp., DeKalb, Ill. (July 3-July 14).
Cornish Wire Co., Inc., Williamstown, Mass. (June 27-July 14—sales warehouses will remain open); New York, N. Y. (June 28-July 14).
Cory Rubber Co., Marion, Ohio (June 30-July 5).
Crescent Insulated Wire & Cable Co., Trenton, N. J. (July 18-Aug. 4).
Crown Products Co., Omaha, Nebr. (June 27-July 7).

Danbury Rubber Co., Inc., Danbury, Conn. (June 29-July 14).
R. E. Darling Co., Inc., Bethesda, Md. (June 29-July 5).
Dasher Rubber & Chemical Co., Fairport Harbor, Ohio (June 22-July 7).
Dayton Rubber Co., Dayton, Ohio (Aug. 18-Sept. 2—stand-by personnel); Waynesville, N. C. (June 30-July 13—stand-by personnel).
De Laval Separator Co., Poughkeepsie, N. Y. (July 14-Aug. 2).
Delford Rubber Co., Inc., Middletown, N. Y. (June 28-July 6).
Denman Rubber Mfg. Co., Warren, Ohio (June 30-July 6).
A. P. de Sanno & Son, Inc., Phoenixville, Penna. (July 28-Aug. 1).
DeVilbiss Co., Toledo, Ohio (June 30-July 11).
Diamond Wire & Cable Co., Sycamore, Ill. (July 4-July 20).
Dill Mfg. Co., Cleveland, Ohio (July 7-July 21).
Dunlop Tire & Rubber Co., Utica, N. Y. (July 26-Aug. 11).
E. I. du Pont de Nemours & Co., Inc., Fairfield, Conn. (July 7-July 14).
Dural Rubber Co., Flemington, N. J. (July 3-July 14).
Durkee-Atwood Co., Minneapolis, Minn. (July 4-July 21); Red Wing, Minn. (June 28-July 14).

Eagle Rubber Co., Inc., Ashland, Ohio (June 20-June 30).
Eastern Insulated Wire Corp., Wallingford, Conn. (July 3-July 14).
Easthampton Rubber Thread Co., Easthampton, Mass. (June 29-July 7).
Edmont Mfg. Co., Coshocton, Ohio (June 30-July 14).
Elastomers, Inc., Fort Myers, Fla. (June 30, July 4).
Electric Hose & Rubber Co., Wilmington, Del. (July 28-Aug. 11).
Elfskin Corp., Worcester, Mass. (June 30-July 7).
Elmhurst Rubber Co., Inc., Elmhurst, N. Y. (Aug. 4-Aug. 15).
Endicott Johnson Corp., Johnson City, N. Y. (July 12-July 21).
Endura Corp., Quakertown, Penna. (July 20-Aug. 3).
Eberhard Faber Pencil Co., Rubber Division, Newark, N. J. (July 11-July 28).
F. D. Farnam Co., Chicago, Ill. (July 3-July 21).
Faultless Rubber Co., Ashland, Ohio (June 21-July 13).
Fawick Flexi-Grip Co., Akron, Ohio (July 3-July 21).
Fibre Leather Mfg. Corp., New Bedford, Mass. (June 28-July 7).
Firestone Tire & Rubber Co., World Bestos Division, New Castle, Ind. (June 29-July 6).
Flexible Tubing Corp., Guilford, Conn. (June 30-July 8).
Fli-Back Co., Inc., High Point, N. C. (June 28-July 7).
Fo-Mac Enterprises, Inc., Tulsa, Okla. (July 4-July 20).

Gagan Brothers, Inc., Everett, Mass. (June 28-July 14).
Gatke Corp., Chicago, Ill. (July 3-July 12); Warsaw, Ind. (July 3-July 12).
Geauga Industries Co., Middlefield, Ohio (July 21-Aug. 4).
General Latex & Chemical Corp., Cambridge, Mass. (June 27-July 14).
General Tire & Rubber Co., Pennsylvania Division, Jeannette, Penna. (June 29-July 7).
Goodall Rubber Co., Trenton, N. J. (July 27-Aug. 11).
B. F. Goodrich Industrial Products Co., DuBois, Penna. (July 11-July 27).
B. F. Goodrich Sponge Products Division, Derby and Shelton, Conn. (June 27-July 14).
Goodyear Footwear Corp., Providence, R. I. (June 27-July 14).
Goodyear Rubber Co., Middletown, Conn. (July 26-Aug. 9).
Goodyear Tire & Rubber Co., Windsor, Vt. (June 27-July 7); New Bedford, Mass. (June 30-July 14).
Goshen Rubber Co., Inc., Goshen, Ind. (July 3-July 14).
Greene, Tweed & Co., North Wales, Penna. (June 30-July 15).
Gro-Cord Rubber Co., Lima, Ohio (June 20-July 7).
Gross Mfg. Co., Inc., Monrovia, Calif. (Dec. 20-Jan. 5, 1959).
Gulf Rubber Co., Inc., Hattiesburg, Miss. (July 4-July 11).

Haartz-Mason, Inc., Watertown, Mass. (June 28-July 8).
Hagerstown Rubber Co., Hagerstown, Md. (June 30-July 7).
Hawkeye Rubber Mfg. Co., Cedar Rapids, Iowa (June 30-July 14).
Henry Engineering Co., Moline, Ill. (July 3-July 17).
Hewitt-Robins, Inc., Stamford, Conn. (July 14-July 28).
Hodgman Rubber Co., Framingham, Mass. (Aug. 4-Aug. 16).
Holz Rubber Co., Inc., Lodi, Calif. (Aug. 18-Sept. 2).
Hoover Co., North Canton, Ohio (July 14-July 26).
E. F. Houghton Co., Philadelphia, Penna. (June 27-July 7).
Houghton Vix-Syn Co., Hopkins, Minn. (June 28-July 8).
Huron Rubber Co., Norwalk, Conn. (June 28-July 7).

Ideal Roller & Mfg. Co., Long Island City, N. Y. (July 20-Aug. 3).
Improved Machinery, Inc., Nashua, N. H. (July 4-July 20).
Indiana Molding Co., Inc., Huntington, Ind. (June 27-July 7).
Industrial Rubber Corp., Brooklyn, N. Y. (July 3-July 14).
Industrial Rubber Cement Co., Hawthorne, Calif. (July 3-July 18).
Inland Rubber Corp., Mansfield, Ohio (June 29-July 7).
Insular Chemical Corp., Hicksville, New York (July 4-July 20).
International Packings Corp., Bristol, N. H. (June 21-July 7).
Irvington Division, Minnesota Mining & Mfg. Co., Monrovia, Calif. (June 30-July 15).

Jacobs Mfg. Co., West Hartford, Conn. (July 28-Aug. 18).
Jacobs Rubber Division, Bullard Clark Co., Danielson, Conn. (June 30-July 4).
Jasper Rubber Products, Inc., Jasper, Ind. (June 27-July 7).

Plant Vacation Schedules (Cont'd)

Jenkins Bros., New York, N. Y. (July 21-Aug. 3); Bridgeport, Conn. (July 21-Aug. 3).
Jewel-Sheen Coating, Inc., Long Island City, N. Y. (June 28-July 14).
Johnson & Johnson, Chicago, Ill. (July 21-Aug. 3).

K & M Rubber Co., Maywood, Ill. (June 30-July 11).
Kaiser Aluminum & Chemical Corp., Bristol, R. I. (July 14-July 25).
Karpex Mfg. Co., Inc., Indianapolis, Ind. (June 21-July 7).
Karman Rubber Co., Akron, Ohio (June 30-July 14).
Kendall Co., Bike Web Plant, South Bend, Ind. (June 28-July 14); Burson Plant, Rockford, Ill. (June 28-July 14).
Kennedy Mfg. Corp., Stoughton, Mass. (June 30-July 14).
Kentile, Inc., Brooklyn, N. Y. (June 28-July 7); South Plainfield, N. J. (June 28-July 14); Chicago, Ill. (June 28-July 14).
Kenworthy Brothers Co., Westboro, Mass. (July 4-July 14).
Kerite Co., Seymour, Conn. (July 3-July 21).
I. B. Kleinert Rubber Co., College Point, N. Y. (July 25-Aug. 11).
Kleistone Rubber Co., Inc., Warren, R. I. (June 27-July 7).

LaFavorite Rubber Mfg. Co., Hawthorne, N. J. (July 3-July 21).
Latex Fiber Industries, Inc., Beaver Falls, N. Y. (July 4-July 21).
Laurel Co., Garfield, N. J. (July 19-Aug. 4).
Laurie Rubber Reclaiming Co., East Millstone, N. J. (June 27-July 14).
Lawrence Hose Co., Trenton, N. J. (July 28-Aug. 11).
Lee Rubber & Tire Corp., Conshohocken, Penna. (Aug. 25-Sept. 2).
W. S. Libbey Co., Lewiston, Maine (June 28-July 7).
Ligonier Rubber Co., Ligonier, Ind. (June 30-July 14).
Luzerne Rubber Co., Trenton, N. J. (June 28-July 14).

MacGregor Sport Products, Inc., Cincinnati, Ohio (Aug. 16-Sept. 2).
Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J. (July 26-Aug. 11).
Martin Rubber Co., Long Branch, N. J. (July 3-July 14).
Metal Hose & Tubing Co., Dover, N. J. (June 27-July 14).
Mine Safety Appliances Co., Pittsburgh, Penna. (July 12-July 27).
Minisink Rubber Co., Inc., Unionville, N. J. (June 30-July 7).
Minnesota Rubber Co., Minneapolis, Minn. (June 23-July 8).
Monarch Rubber Co., Inc., Baltimore, Md. (June 27-July 7).
D. W. Moor Rubber Corp., Wapakoneta, Ohio (July 4-July 21).

Narragansett Wire Co., Pawtucket, R. I. (July 18-Aug. 4).
National Electric Products Corp., Ambridge, Penna. (July 3-July 21); Elizabeth, N. J. (Aug. 3-Aug. 18).
New Jersey Rubber Mfg. Co., Inc., Union City, N. J. (July 4-July 21).
New York Rubber Corp., Beacon, N. Y. (July 4-July 21).
Newth Rubber Co., Barrington, R. I. (June 28-July 14).
Norbalt Rubber Corp., North Baltimore, Ohio (June 28-July 14).
Nukraft Mfg. Co., Inc., Shelbyville, Ind. (June 27-July 14).
Nye Rubber Co., Barberton, Ohio (June 29-July 6).

Okonite Co., Passaic, Paterson, and North Brunswick, N. J. (July 13-July 27).
Oliver Tire & Rubber Co., Oakland, Calif. (July 4-July 13).

Paeco Rubber Co., Ravenna, Ohio (June 27-July 7).
Passaic Rubber Co., Clifton, N. J. (July 19-Aug. 4).
Paterson Parchment Paper Co., Bristol, Penna. (July-4-July 20).
Paul-Martin Rubber Corp., Holyoke, Mass. (July 12-July 20).
Pellon Corp., Lowell, Mass. (June 28-July 14).
Peters Mfg. Co., Wollaston, Mass. (June 27-July 14).
Pierce Roberts Rubber Co., Trenton, N. J. (July 25-Aug. 11).
Pilot Packing Co., Inc., New York, N. Y. (July 18-Aug. 4).
Plabell Rubber Products, Inc., Toledo 4, Ohio (June 28-July 7).
Plastic and Rubber Products Co., Los Angeles, Calif. (June 30-July 6).
Plymouth Rubber Co., Inc., Canton, Mass. (June 30-July 7).
Polymer Adhesives & Polymer Industries, Springdale, Conn. (June 30-July 5).
Premier Rubber Mfg. Co., Dayton, Ohio (June 28-July 7).
Pyramid Rubber Co., Ravenna, Ohio (June 27-July 17).

Quabaug Rubber Co., North Brookfield, Mass. (June 27-July 7).

Rainfair, Inc., Racine, Wisc. (June 30-July 14).
Randolph Mfg. Co., Randolph, Mass. (June 27-July 14).
Rapid Roller Co., Chicago, Ill. (July 28-Aug. 9).
Raybestos Division, Raybestos-Manhattan, Inc., Stratford, Conn. (July 21-July 27).
Ridbo Laboratories, Danville, Ill. (July 6-July 20).
Robbins Floor Products, Tuscumbia, Ala. (July 1-July 14).
Rogers Corp., Rogers, Manchester and Willimantic, Conn. (July 28-Aug. 11).
Roth Rubber Co., Cicero, Ill. (July 11-July 25).
Rubber & Asbestos Corp., Bloomfield, N. J. (July 4-July 13).
Rubber Corporation of America, Hicksville, N. Y. (July 4-July 20).
Rubber Corporation of Pennsylvania, West Hazelton, Penna. (June 28-July 6).
Rubber Covered Products Co., Inc., Pawtucket, R. I. (Aug. 4-Aug. 16).
Rubber Millers, Inc., Baltimore, Md. (July 7-July 21).
Rway Synthetic Products Division, Reiss Mfg. Corp., Little Falls, N. J. (Aug. 4-Aug. 11).

W. H. Salisbury & Co., Chicago, Ill. (June 28-July 14).
Sandusky Abrasive Wheel Co., Sycamore, Ill. (June 28-July 12).
Scandinavia Belting Co., Charlotte, N. C. (June 30-July 14).
Schact Rubber Mfg. Co., Huntington, Ind. (June 27-July 14).
Julius Schmid, Inc., Little Falls, N. J. (Aug. 18-Sept. 1).
Scully Rubber Mfg. Co., Baltimore, Md. (June 30-July 6).
Seaboard Chemicals, Inc., Salem, Mass. (June 30-July 14).
Seamless Rubber Co., New Haven, Conn. (Aug. 4-Aug. 15).
Seiberling Latex Products, New Bremen, Ohio (June 27-July 7).
Seiberling Rubber Co., Akron, Ohio (Aug. 23-Sept. 2).
Silica Rubber Co., Sylvania, Ohio (July 27-Aug. 9).
Sloan Valve Co., Chicago, Ill. (July 14-July 28).
South Haven Rubber Co., South Haven, Mich. (June 29-July 6).
Southeastern Rubber Mfg. Co., Athens, Ga. (June 28-July 7).
Specialty Insulation Mfg. Co. Inc., Hoosick Falls, N. Y. (July 12-July 28).
Sperry Rubber & Plastics Co., Brookville, Ind. (Aug. 4-Aug. 18).
Stalwart Rubber Co., Bedford, Ohio (June 28-July 14).
Standard Coated Products, Inc., Buchanan, N. Y. (June 27-July 15).
Standard Washer & Mat, Inc., Manchester, Conn. (July 12-July 28).
Stedfast Rubber Co., Mattapan, Boston, Mass. (June 28-July 7).
Stokes Molded Products Division, Electric Storage Battery Co., Trenton, N. J. (July 4-July 21).
Stoner Rubber Co., Inc., Anaheim, Calif. (July 7-July 21).
Suflex Corp., Woodside, N. Y. (July 20-Aug. 4).
Surety Rubber Co., Carrollton, Ohio (June 29-July 6).
Surgical Rubber Co., Norristown, Penna. (June 29-July 5).
Synthon, Inc., Cambridge, Mass. (June 27-July 6).

T & M Rubber Specialties Co., Inc., Goshen, Ind. (June 30-July 7).
Taylor Bros. Co., Cleveland, Ohio (June 28-July 7).
Technical Tape Corp., New Rochelle, N. Y. (June 30-July 13).
Thermoid Co., Trenton, N. J. (July 21-Aug. 4).
Thermoid Western, Division of Thermoid Co., Nephi, Utah (July 23-Aug. 4).
Tigron Latex & Chemical Corp., Stoughton, Mass. (June 30-July 6).
Timme Corp., Wilmington, N. C. (June 28-July 7).
Tingley Rubber Corp., Rahway, N. J. (July 11-July 28).
Tompkins Rubber Co., Plymouth Meeting, Penna. June 28-July 14).
Tyer Rubber Co., Andover, Mass. (July 12-July 28).

U B S Chemical Corp., Cambridge, Mass. (June 30-July 13).
United States Rubber Co., Chicago, Ill.: Mishawaka, Ind., Waterbury, Conn., Naugatuck, Conn., Providence, R. I., Santa Ana, Calif., Stoughton, Wisc., Washington, Ind., Ft. Wayne, Ind., Woonsocket, R. I., Baton Rouge, La. (July 4-July 21); Passaic, N. J., Philadelphia, Penna., Sandy Hook, Conn. (June 27-July 14); Chicopee Falls, Mass. (July 4-July 21 and Sept. 1-Sept. 9); Detroit, Mich. (July 4-July 21 and Oct. 20-Oct. 27); Eau Claire, Wisc. (July 4-July 21 and Aug. 25-Sept. 2); Indianapolis, Ind. (July 4-July 28); Los Angeles, Calif. (July 4-July 21 and Dec. 22-Dec. 29); Burlington, N. C., Gastonia, N. C., Hogansville, Ga., Manchester, N. H., Scottsville, Va., Shelbyville, Tenn., Winnsboro, S. C., Reaford, N. C. (June 30-July 14); Painesville, Ohio (July 21-Aug. 4).

Vail Rubber Works, Inc., St. Joseph, Mich. (June 27-July 7).
Victor Balata & Textile Belting Co., Easton, Penna. (July 26-Aug. 7).
Victor Mfg. & Gasket Co., Chicago, Ill. (July 14-July 25).
Virginia Chemical Corp., Lynchburg, Va. (June 30-July 7).
W. J. Voit Rubber Corp., Los Angeles, Calif. (June 28-July 14).
Vulcanized Rubber & Plastics Co., Morrisville, Penna. (July 21-Aug. 4).
Vulplex, Inc., North Abington, Mass. (June 27-July 7).

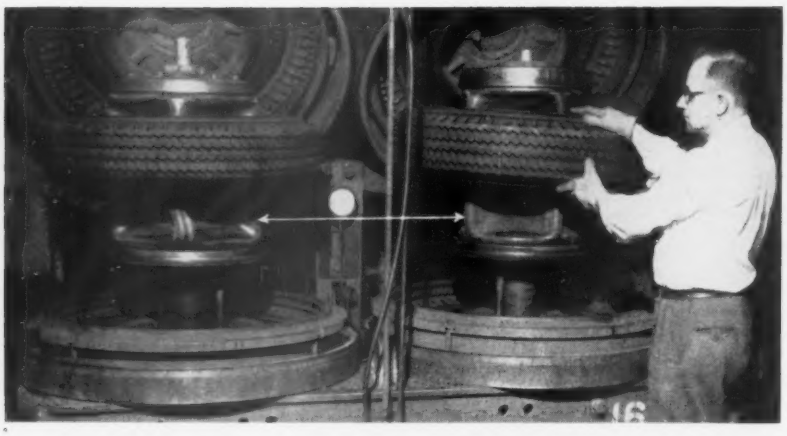
Wadsworth & Woodman Division, Interchemical Corp., Winthrop, Maine (June 27-July 14).
Walker Brothers, Conshohocken, Penna. (July 7-July 13).
Waukesha Rubber Co., Waukesha, Wisc. (July 3-July 20).
Weldon Roberts Rubber Co., Newark, N. J. (July 7-July 21).
Welco Shoe Corp., Waynesville, N. C. (June 27-July 14).
West Co., Phoenixville, Penna. (Aug. 4-Aug. 11); Millville, N. J. (July 14-July 20).
Western Electric Co., All Plants (July 13-July 27).
Westinghouse Air Brake Co., Air Brake Division, Wilmerding, Penna. (July 28-Aug. 2).
S. S. White Dental Mfg. Co., Staten Island, N. Y. (June 30-July 8).
Williamson Co., Madison, Ind. (June 20-July 6).
Williamson Adhesives, Inc., Skokie, Ill. (July 14-July 25).
Windram Mfg. Co., South Boston, Mass. (June 30-July 4).
F. P. Wohl & Co., Philadelphia, Penna. (June 27-July 13).
Worthington Ball Co., Elyria, Ohio (Aug. 15-Sept. 2).

Xylos Rubber Co., Akron, Ohio (June 30-July 13).

Yaleco Rubber Co., Inc., New Haven, Conn. (June 28-July 12).
Youngs Rubber Corp., Trenton, N. J. (July 18-Aug. 4).

Canada

American Biltrite Rubber Co. (Canada), Ltd., Sherbrooke, Que. (June 28-July 7).
American Wringer Co., Farnham, Que. (July 18-Aug. 4).
Armet Industries, Ltd., Guelph, Ont. (July 28-Aug. 5).
Asbestonos Corp., Ltd., St. Lambert, P. Q. (July 19-Aug. 3).
Biltrite Rubber Co., Toronto, Ont. (July 7-July 19).
Boston Insulated Wire & Cable Co., Ltd., Hamilton, Ont. (July 21-Aug. 5).
British Rubber Co., Ltd., Lachine, Que. (July 4-July 21).
Canadian General-Tower, Ltd., Galt, Ont. (July 18-Aug. 5).
Canadian Industries, Ltd., Fabrikoid Division, New Toronto, Ont. (Aug. 2-Aug. 18).
Canadian Technical Tape, Ltd., Montreal, Que. (July 26-Aug. 3).
Dunlop Canada, Ltd., Toronto and Whitby (July 26-Aug. 11).
Firestone Tire & Rubber Co. of Canada Ltd., Hamilton, Ont. (Aug. 2-Aug 17).
General Tire & Rubber Co. of Canada, Ltd., Welland, Ont. (July 18-Aug. 5).
Gould-National Batteries of Canada, Ltd. Kingston, Ont. (June 27-July 14).
Gutta Percha & Rubber, Ltd., Toronto, Ont. (July 21-Aug. 4).
Johnson & Johnson, Ltd., Montreal, P. Q. (July 26-Aug. 10).
Kaufman Rubber (Ontario) Ltd., Kitchener, Ont. (July 18-Aug. 6).
Lion Rubber & Plastics, Ltd., Ville LaSalle, Que. (July 4-July 14).
Mansfield Rubber (Canada) Ltd., Barrie, Ont. (July 26-Aug. 5).
Miner Rubber Co., Ltd., Granby, P. Q. (July 11-Aug. 4).
Minnesota Mining & Mfg. of Canada Ltd., London, Ont. (July 11-July 28).
Northern Electric Co., Ltd., Lachine, Que. (July 14-July 26).
Phillips Electrical Co., Ltd., Brockville, Ont. (July 19-Aug. 4).
Pirelli Cables, Conduits, Ltd., St. Johns, Que. (July 20-Aug. 21).
Joseph Robb & Co., Ltd., Montreal, Que. (July 11-July 28).
St. Lawrence Rubber Co., Farnham, Que. (July 18-Aug. 4).
A. Schrader's Son, Division Scovill Mfg. Co., Toronto, Ont. (July 21-Aug. 5).
Seiberling Rubber Co., Toronto, Ont. (Aug. 18-Sept. 1).
M. L. Snyder & Son, Ltd., Woodbridge, Ont. (July 19-Aug. 5).
A. G. Spalding & Bros., Brantford, Ont. (Aug. 15-Sept. 2).
Stedfast Rubber Co. (Canada) Ltd., Granby, Que. (July 7-July 21).
Sterling Rubber Co. Ltd., Guelph, P. Q. (July 28-Aug. 11).
Viceroy Mfg. Co., Ltd., Toronto, Ont. (July 12-July 22).



Vital role played by bladders in tire manufacturing is shown in this photo at the Mansfield Tire & Rubber Co. (arrow points to bladder). Here, an employee removes a finished tire from a press after the bladder has performed its job of keeping the tire in proper shape during vulcanization.

Esso MD 551 Bladders Triple Equipment Life

► Esso Research and Engineering Co. of Linden, N. J. has announced the development of a new low unsaturation rubber which is said to triple the life of key equipment used in manufacturing tires. Named "MD 551," the new polymer withstands high temperatures, can be cured rapidly, is compatible with both natural and other synthetic rubbers, resists distortion and is less vulnerable than other rubbers to harmful chemical elements in the air such as ozone. In demonstrations of the product's heat-resistance, an average of 625 auto tires was produced with curing press bladders made of the new synthetic at a 385°F. temperature. Under such conditions, only about 200 tires can be cured with conventional bladders before they wear out, Esso states.

MD 551 possesses butyl rubber's inherent properties, including superior air holding and anti-ozone resistance. The new rubber's additional advantages, such as compatibility with other polymers and faster curing rates, are expected to open numerous markets previously denied low unsaturation rubber. Potential applications for MD 551 include use in truck tires, white sidewalls, retreads for tires, innerliners for tubeless tires, high-performance mechanical rubber goods and various products subjected to high temperatures such as the curing press bladders, steam hose, conveyor belts and wire insulation materials.

The new synthetic was perfected during more than three years of research at the Esso Research Center, at the affiliated Baton Rouge laboratories, and in tire plants. Plans are now under way for commercial-volume production of MD 551. The feasibility of large scale production was proved in the Baton Rouge pilot plant with a capacity of one ton a day. An expansion of the pilot unit to three tons is under consideration.

Callery Offers Triethylborane

► Callery Chemical Co., Pittsburgh, Penna., has announced that triethylborane $(C_2H_5)_3B$ is now available in 20-ml. sample quantities for experimental studies. A catalyst for polymerization of unsaturated monomers such as olefins, styrene, acrylonitriles and acrylic and vinyl compounds, this compound permits the synthesis of alcohols from olefins. It may be used as a jet fuel or fuel component because of its unusual combustion properties, and as an igniter or flame-speed accelerator. Triethylborane, a colorless liquid miscible with organic solvents, may react with those containing functional groups. The chemical is immiscible with water and does not hydrolyze; is a Lewis acid which forms complexes with ammonia, amines and sodium hydride; is spontaneously flammable, its vapors igniting in oxygen at partial pressures below 1 mm at 0°C.; melts at —92.8°C., and boils at 95°C.

ASTM Standard Index Released

► American Society for Testing Materials, 1916 Race St., Philadelphia, Penna., has issued the "1957 ASTM Index to Standards," which supersedes all previous indexes. An adjunct to the Book of ASTM Standards, the Index comprises a ready reference for locating ASTM standards in the bound publication and should also be of service in ascertaining whether the Society has issued a standard on a specific subject. The booklet composed of a subject and numeric index, the subject index includes the 1394 ASTM standards and 955 tentatives in effect as of December, 1957, listed under appropriate key words. The numeric index is a list of standards in continuous numeric sequence of ASTM serial designations, giving the complete title and publication reference of each standard. When the ASTM designation of a particular standard is known, this list will be especially useful.

Brazilian Group to Study Synthetic Plant Proposal

► President Juscelino Kubitschek has instructed the National Research Council of Brazil to study the possibility of setting up a synthetic rubber plant in that South American country. It is estimated that Brazil will need about 85,000 tons of rubber in 1960 to supply the growing automobile industry. Even though new rubber tree plantings are being made largely of an improved grafted variety in Brazil, and new rubber growing areas are being developed, it is unlikely that natural production will meet the demand. The most optimistic projections for natural rubber forsee no more than 70,000 tons per annum.

Officials of the Brazilian government reported that Petrobras (the nationalized Brazilian petroleum company) and the National Bank for Economic Development have proposed a plan for construction of a butadiene-styrene synthetic rubber plant. These plans call for a factory in the vicinity of Caxias, in the state of Rio de Janeiro, with a proposed annual production of about 40,000 tons. Proponents of synthetic rubber point out that an increased standard of living is bound to result from the new industrialization of the country which will bring about a much higher consumption of rubber. In addition, they expect that rubber exports can be increased.

Alco Oil Offers Alcogum AN-25

► Alco Oil and Chemical Corp., Philadelphia, Penna., has announced the availability in commercial quantities of "Alcogum AN-25", said to be a new, effective, polyelectrolyte which combines the properties of deflocculation and colloidal protection for dispersions of dry powders. Supplied as a water solution, the new chemical stabilizes dispersions and emulsions against settling or caking during storage, partly because it is a viscosity stabilizer. In certain applications, it can be used to improve the spreading characteristics to enhance color by preventing flocculation and to increase the extent of dilution of emulsions. Alcogum AN-25 is said to be easy to handle in spite of its high solids content because it will pour from a faucet. The material has a total solids content of 25 per cent, its weight per gallon is 9½ pounds, it has a pH of 10 and viscosity of 25 poises.

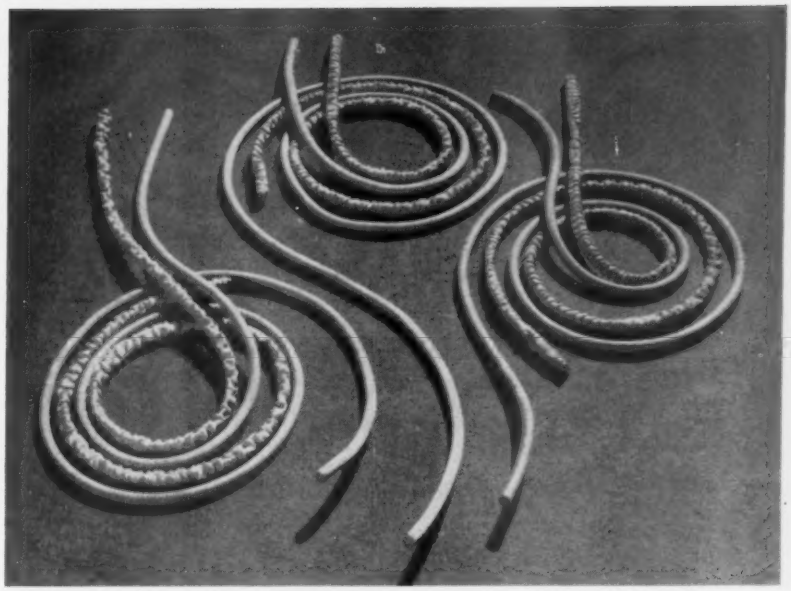
Kessler Chemical Names Pings

► Kessler Chemical Co., Inc. of Philadelphia, Penna., has announced the appointment of Wilbur B. Pings as general manager of their varied chemical lines. A graduate of the University of Illinois and the University of Minnesota, Mr. Pings was previously connected with the Dupont Experimental Station in Wilmington, Del. His former associations include Arthur D. Little, Inc., Godfrey L. Cabot, Inc., Witco Chemical Co., Air Products, Inc. and Vitro Laboratories. Mr. Pings holds memberships in the American Chemical Society and the Chemical Market Research Association.

NRB Announces Availability of Superior Processing Rubber

► The Natural Rubber Bureau of Washington, D.C. has announced that superior processing (SP) rubber is now available as ribbed smoked sheets, air dried sheets and crepe, all possessing the superior processing qualities of the original SP crepe. Manufacturers have found, NRB states, that SP rubber offers advantages in extruding, calendering, reworking and pan curing. It is said to contain physical properties of the highest order, and offers significant savings in production costs compared with other rubbers. Taken as a whole, NRB declares, these constitute sound reasons for all users of first quality rubber to determine which of their production lines would benefit by the use of SP rubber.

SP crepe has been used in the regular production of surgical goods, extrusions of complicated shapes in pastel shades, and in the manufacture of cut thread. Packed in 80 pound bales and wrapped in polyethylene with an outer coating of stout sisal-kraft paper, SP crepe stacks well in the factory stores and is easily handled.



Long smooth circular extrusions from SP rubbers contrast with the rough short lengths from corresponding rubber grades extruded under identical conditions of temperature and extruder rate. Pale crepe is shown on the left; air dried sheet in the center, and ribbed smoked sheet on the right. Extruded through a 1/8-inch circular die, the samples shown are pure gum rubber.

SP Rubber Usage Extended

Usage of SP rubber has now been extended by giving SP properties to sheet grades, and SP ribbed smoked sheet is in commercial production on Malayan estates, where it is prepared as 250 pound bare-backed bales. This grade forms the greatest production of SP rubber, and is in regular use by a number of manufacturers.

SP air dried sheet is, at present, in pilot scale production at the Rubber Research Institute of Malaya's Experimental Station and is intended for use in cases where the lightest shades of color are not required, and yet smoked sheets would be unsuitable. Production is carried out on Malayan estates under license from the Rubber Research Institute of Malaya, which applies strict technical control to ensure that each consignment of SP rubber exported is of the desired superior processing quality.

The basis of SP rubber is a mixture of vulcanized rubber with field latex to give a 1:4 ratio by weight of dry rubber, which is worked up into sheet or crepe by conventional plantation methods. Tests at RRI have shown that this 1:4 ratio of vulcanized to unvulcanized rubber represents the best compromise of properties consistent with ease of production on the estate and a satisfactory level of superior processing properties to give trouble-free processing in the factory.

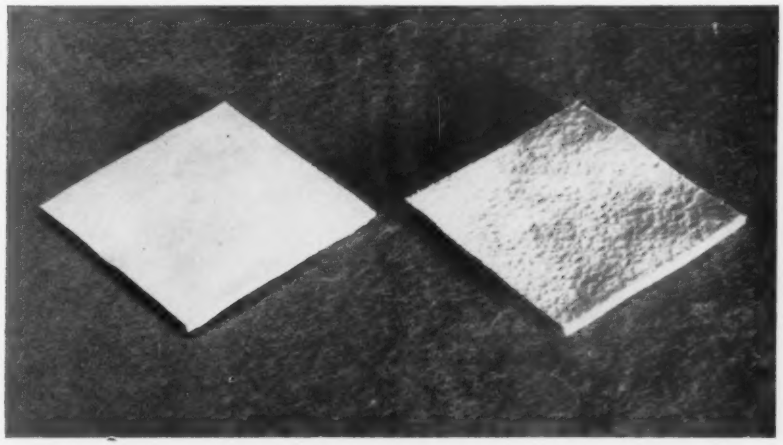
With SP rubber, a greater conformity to gauge and good surface finish can be obtained over a wider range of calendering temperature conditions than with regular grades. SP rubbers also show a well defined tendency to reduce water marking in open steam curing. The SP rubbers are also effective in the presence of appreciable loadings of fillers and have a correspondingly wide scope for their application in industry. Particularly, they impart the properties of high grade natural rubber, with the consequent opportunities for obtaining required physical properties with greater economy.

The greater stability to mill breakdown of compounds based on SP rubbers has an important practical consequence in processes which give rise to large quantities of blanking scrap, enabling users to rework their compounds with less loss of properties than is usual. Flow of unvulcanized SP compounds during storage is less than for regular grades.

Higher Cure Rate Noted

With some vulcanizing systems, SP rubbers give a higher rate of cure which may be reflected in shorter scorch times. This may be regulated in some cases, if desired, by a reduction in vulcanizing components, and if the process is very critical in respect to scorch danger, reduction of accelerator and addition of retarder assures adequate safety, NRB advises.

A full report on SP rubbers appears in the current edition of "Rubber Developments", quarterly publication of the Natural Rubber Bureau, 1631 K St., N.W., Washington, D.C.



Depicted above are samples of calendered goods after open steam cure. When SP rubber is used, as shown by the example on the left, there is a well-defined reduction in water marking.

Appointed Stauffer Vice-President

► Charles A. Lindsay has been appointed vice-president and general manager of the Molded Products Division of the Stauffer Chemical Co. at Los Angeles, Calif. A graduate of the University of California, Mr. Lindsay joined Stauffer in 1943 as a plant manager.

Names in the News

J. H. Ruskin, formerly general manager for the Fine Chemicals Division of the American Cyanamid Co., has been elected president and a director of the Arizona Chemical Co., which is jointly owned by American Cyanamid and International Paper Co.

H. Dorn Stewart, previously manager of the Floor Division, Armstrong Cork Co., has been appointed assistant to the executive vice-president of the Allied Chemical and Dye Corp.

Archie E. Albright, formerly assistant to the president of the Stauffer Chemical Co., has been elected a vice-president of the company.

Paul G. Hykes, executive engineer of the Wheel Branch of the Budd Co., has been elected president of the Tire and Rim Association, Inc., the technical standardizing body for United States tire and rim manufacturers.

Edward J. Mackey has been appointed manager of management engineering for the Goodyear Tire & Rubber Co., succeeding **George Sherry** who has retired from that post and as a member of the president's staff after 39 years with the company.

Robert V. Cleary, control manager at Mishawaka, Ind., for the U. S. Rubber Co., has been elected to membership in the Controllers Institute of America.

Lewis C. Pape, formerly general sales manager for American Latex Products Corp., has been named general sales manager for the Foam Division of the Dayton Rubber Co.

L. W. Adams, Southern Region sales manager for the Industrial Products Division of the Goodyear Tire and Rubber Co. since 1953, has been appointed manager of V-belt sales for the company, succeeding **J. F. Taylor,** who is retiring.

Walter A. Sheehan, formerly New England chemical sales manager for the Dow Chemical Co., has been appointed sales manager of the Fire Hose Division for the Boston Woven Hose and Rubber Co.

J. J. Lincoln, Jr., vice-president Southern region of Air Reduction Sales Co., has been appointed president of Pure Carbonic Co., Division of Air Reduction Co., Inc., succeeding **E. R. Lawrence** who has been named chairman of the Pure Carbonic Division.

D. A. Yett has been appointed to the newly created position of supervisor of budget operations for the Passenger Tire Sales Department of the Seiberling Rubber Co.

Fred C. Traflet has joined the U. S. Rubber Reclaiming Co., Inc., as a special consultant in product development and market analysis.

Howard C. Sommer, formerly with the Dryden Rubber Division of Sheller Manufacturing Corp., has been appointed director of sales of the Industrial Products Division of the General Tire & Rubber Co.

William O'Neil, president of the General Tire & Rubber Co., has been named vice-chairman of the 1958 Special Gifts Campaign of the National Conference of Christians and Jews.

Kenneth H. Meyer, director of engineering, was elected vice-president of C. B. Hunt & Son, Inc., Salem, Ohio, manufacturers of air and hydraulic control valves and pressure specialties.

Marcy W. Osborne, Jr., previously manager of international sales for the B. F. Goodrich Chemical Co., has been appointed to the newly created position of manager of propellant materials for the firm.

John J. O'Connor, former director-superintendent of Alba/SA, Borden's chemical organization in Brazil, has been named vice-president of international operations for the Borden Chemical Co.

William F. Conroy, who joined the Wyandotte Chemicals Corp. in 1957, has been named a resident sales representative for the company's Michigan Alkali Division.

Edward A. Taylor, who has been associated with the firm for twelve years, has been named plant manager of the new West Elizabeth plant for the Pennsylvania Industrial Chemical Corp.

Harvey B. Merrill, Jr., formerly manager of standard products sales for Radio Corp. of America, has been named vice-president and general manager for Ernest F. Fullam, Inc., research consultants.

Paul H. Emmett of Johns Hopkins University, one of the nation's leading physical chemists, has been named to receive the $1,000 Kendall Co. award in Colloid Chemistry.

R. G. Luskin, formerly special representative servicing accounts in the Southwest, has been appointed West Coast district manager for the Chemical Division of the Goodyear Tire & Rubber Co.

L. E. Judd, director of public relations for the Goodyear Tire and Rubber Co. for 26 years, has announced his retirement effective June 1.

Theodore M. Vial

Promoted By American Cyanamid

► Organic Chemicals Division of the American Cyanamid Co., New York, N. Y., has announced the appointment of Dr. Theodore M. Vial as manager of technical service in the Rubber Chemicals Department. A graduate of the University of Maryland and the University of Illinois, Dr. Vial was associated with Chas. Pfizer & Co., before he joined American Cyanamid in 1950. Since 1954, he has held supervisory positions in the New Product Development Department of the company. Dr. Vial is a member of Phi Lambda Upsilon, honorary chemical fraternity and Sigma Xi, honorary scientific society. He also belongs to the American Chemical Society and the American Association for the Advancement of Science.

Arthur M. Pounds, previously a senior technical man, has been appointed supervisor of new product development at the B. F. Goodrich Chemical Co. Development Center at Avon Lake, Ohio.

Edward M. Bader, manager of quality control for B. F. Goodrich Aviation Products during the past 14 months, has been named division manager of quality control for the B. F. Goodrich Tire Co., succeeding **Leonard M. Freeman,** who has retired.

J. R. MacDonald, president and chairman of the board for the General Cable Corp., has been elected treasurer of the National Electrical Manufacturers Association for 1958.

James A. Napier, formerly assistant sales manager for the Tire Division of the U. S. Rubber Co., has been named director of allied sales sections of the Division, a newly created post.

Ross A. de Matteo, II, who has been with Anaconda Wire & Cable Co. since 1947, has been appointed manager of export sales succeeding **William D. Balma'n,** who has retired.

Each Witco-Continental plant represents years of experience and know-how in the production of furnace or channel black. Together, they insure carbon blacks of the highest quality, and suited to individual needs of each rubber goods manufacturer. **WITCO CHEMICAL COMPANY—CONTINENTAL CARBON COMPANY**

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Continex SRF-NS

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Oil Furnace Blacks

Continex HAF
Continex ISAF
Continex CF

SUNRAY, TEXAS

Gas Furnace Blacks

Continex SRF
Continex SRF-NS
Continex HMF

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England's National College Plans Elastomers Course

► National College of Rubber Technology, London, England, will give a two-week residential course, from July 7 to 18, 1958, on "Chemical Analysis of Rubbers and Plastics", which will include lectures and practical work designed to assist those with some knowledge of polymer analysis to keep up-to-date with recent developments. Early application is desirable as accommodations for the course are limited. Scheduled lectures include:

(1) Introduction—Survey of the Subject; (2) Qualitative Identification of Elastomers; (3) Qualitative Identification of Plastomers; (4) Qualitative Identification of Fillers and Pigments; (5) Quantitative Estimation of Elastomers; (6) Quantitative Estimation of Plastomers; (7) Quantitative Estimation of Fillers and Pigments; (8 & 9) Identification and Estimation of Trace Ingredients (cross-linking agents, accelerators, antioxidants, stabilizers, etc.); (10 & 11) Identification and Estimation of Plasticizers, Softeners, Extenders and Like Materials; (12) Chemical Analysis of Latices; (13 & 14) Principles and Application of Physical Methods Used in Rubber and Plastics Analysis (absorption spectra, X-rays, gas chromatography, polarography, etc.); (15 & 16) Related Topics—Polymer Degradation and Chemical Aging Tests.

Practical work will include: (1) Identification of Uncompounded Polymers; (2) Analysis of Vulcanized Rubbers:—Elastomer Identification. Quantitative Ash: Qualitative Ash Analysis. Quantitative Filler Estimation (e.g. blacks). Estimation of Sulphur and Other Vulcanizing Agents. Identification and Estimation of Plasticizers. Identification of Accelerators and Antioxidants; (3) Analysis of Commercial Plastics (additional procedures); (4) Chemical Analysis and Testing of Latices.

Arrangements are being made for students to gain experience in the use of infra-red spectrometer, the polarograph, the gas chromatograph, the electron microscope and other physico-chemical equipment. For an application form, write to The Head, National College of Rubber Technology, Northern Polytechnical, Holloway Road, London, N. 7.

Offering Nylon Truck Tire

► General Tire & Rubber Co., Akron, Ohio, has announced that the company is offering, for the first time, nylon cord construction in a standard line of truck tires. The line is the "Traction Rib Special Service", which was introduced several months ago and is said to give 10 per cent more original mileage than the tire it replaced, with no change in price. The new nylon tire will retail at about 10 per cent above the rayon constructed model. The company expects nylon to give greater tire body strength and to enable the tire to turn in many more recap miles. For truck, tractor and trailer use, the tire is available in twin bead sizes. It is made in both nylon and rayon construction at the company's Akron, Ohio and Waco, Texas tire plants.

English Synthetic Unit Underway

► The new plant of the International Synthetic Rubber Co., Ltd., at Fawley, England, has gone on stream as England's first entry into synthetic rubber production. The plant is expected to produce 50,000 long tons of butadiene-styrene rubber in its first year of operation. Design and construction of the new facility was done by Chemical Plants Division of the Blaw-Knox Co., Pittsburgh, Penna. Preliminary engineering work needed to develop material and utility balances, process flow sheets, functional equipment, building layouts and certain specifications was done in the firm's Pittsburgh office. After shipment of the design drawings to England, definitive construction drawings including all architectural, structural, piping, heating and electrical work were prepared, and equipment purchased in England. Blaw-Knox also supervised the initial start-up, trained the operating personnel and prepared the necessary instruction manuals. The International Synthetic Rubber Co. is a newly formed producing company organized by Dunlop Rubber Co., Ltd., Goodyear Tyre & Rubber Co. (Great Britain) Ltd., Firestone Tyre & Rubber Co., and Michelin Tyre Co., Ltd.

Plans To Make Small Car Tires

► Seiberling Rubber Co., Akron, Ohio, has announced plans to produce tires for most makes of sports cars and other small automobiles. To cover most of the field, Seiberling will sell its premium "Safety" tire in several sizes, in both black and white sidewall and in tubeless construction. Designated for the replacement market, some tires will be imported from Seiberling Rubber Co., Great Britain, Ltd., while others will be produced in the Akron plant. Available sizes will be 5.20-13, 5.60-13, 5.90-13 and 6.40-13, and 5.00/5.25/5.60-15, 5.50/5.90-15 and 6.00/6.40-15.

Geigy Promotes Tobin

► Geigy Industrial Chemicals, Ardsley, N. Y., has announced the appointment of William W. Tobin as technical sales representative for the metropolitan New York and Connecticut areas. Mr. Tobin, a graduate of Providence College with a B.S. in chemistry, joined Geigy Industrial Chemicals in 1955, after his release from the U. S. Navy, where he had served as lieutenant, j. g. Following two years in the company's technical service organization, Mr. Tobin was appointed New England sales representative. In his new capacity, he will also continue to represent the company in New England.

Burrell Named General Manager

► J. E. Burrell, formerly assistant to the vice-president in charge of operations of the Columbia-Southern Chemical Corp. of Pittsburgh, Penna., has been appointed general manager of operations. Mr. Burrell succeeds the late Robert L. Hutchison who served as vice-president in charge of operations. A chemical engineering graduate of the University of Michigan, Mr. Burrell joined Columbia-Southern at Barberton, Ohio, as a research and development engineer in 1941. Following various operating and technical assignments at Barberton, he was transferred to the Natrium, West Va., plant as operations superintendent in 1952. He was appointed assistant to the vice-president of operations, with headquarters at the Pittsburgh general office, in 1956. A native of Aurora, Ill., Mr. Burrell is a member of the A. C. S. and A. I. C. E.

Appoints Three Distributors

► The Chemical Division of International Latex Corp., Dover, Del., manufacturers of "Tylac" synthetic latex, has announced the appointment of three new distributors. The new distributors, who will cover all industries utilizing latices, are Technical Industries, Wakefield, R. I.; Latex and Rubber, Inc., Baltimore, Md., and E. P. Lambert Co., Akron, Ohio.

Financial News

United Carbon

► For 1957: Net income of $6,235,954, which is equal to $5.22 per share, compared with $6,013,326, or $5.04, the year before. Sales in 1957 totaled $59,254,653, compared with $59,721,769 in 1956. At the close of the year, current assets were $24,285,080 and current liabilities, $8,149,123, compared with assets of $22,529,499 and liabilities of $7,733,605, in the preceding year.

Raybestos-Manhattan

► For 1957: Net income of $3,452,240, which is equal to $5.47 per share, compared with $4,108,235, or $6.54 a share, in 1956. Sales in 1957 totaled $82,176,291, compared with $84,630,819, the year before. Current assets at year's end amounted to $33,299,644.63, compared with $33,685,763.76 at the end of 1956 and liabilities were $6,776,041.99 in 1957 and $7,665,723.22 the year before.

Midwest Rubber Reclaiming

► Quarter to January 31: Net income of $210,066, which is equal to 70c per common share, compared with $161,711, or 52c a common share, in the first quarter of 1956. Sales in the 1957 fiscal quarter to January 31 totaled $2,404,416 compared with $2,181,037 in the corresponding quarter of the preceding year.

Lee Rubber

► Quarter to January 31, 1958: Estimated net income of $279,382, which is equal to 33c per share, compared with $336,417, or 40c, in the first three months of fiscal 1957. Sales in the first quarter of fiscal 1958 totaled $9,935,019 compared with $10,612,968 in the corresponding period of the preceding year.

Dayton Rubber

► Quarter to January 31: Net income of $200,963, which is equal to 17c per common share, compared with $441,412, or 46c a share, in the corresponding fiscal period of the preceding year. Sales in the quarter to January 31 totaled $18,222,727 compared with $16,353,349 in the first quarter of 1956.

O'Sullivan Rubber

► For 1957: Net income of $202,647, which is equal to 43c a common share, compared with $3,369 in 1956. Net sales last year totaled $6,440,620, compared with $6,346,080 the year before.

Jenkin Bros.

► For 1957: Net income of $1,271,341, which is equal to $9.97 per common share, compared with $1,213,640, or $9.52 a share, in the preceding year.

Thiokol Chemical

► For 1957: Net income of $1,451,551, which is equal to $1.41 per share, compared with $952,335, or 95c, a share, in the preceding year. Sales last year totaled $30,947,457 compared with $21,013,527 in 1956. The per share earnings in 1957 were adjusted to reflect two-for-one stock split effective in January, 1958 while those for 1956 were adjusted to reflect two-for-one stock split and 5% stock dividend effective in January, 1958, and in November, 1957, respectively.

National Rubber Machinery

► For 1957: Net income of $208,098, which is equal to $1.01 a share, compared with $691,111, or $3.53 a share, in the preceding year. Sales last year totaled $13,280,000, compared with $16,154,858 the year before. The company states that the low rate of earnings in 1957 resulted from a decline in gross profit and larger expenditures for selling, engineering and product development. Gross profit declined because high material and labor costs had to be absorbed to meet price-cutting.

Industrial Rayon

► For 1957: Net income of $1,199,555, which is equal to 65c per share, compared with $4,543,719, or $2.45 a share, in the preceding year. Sales last year totaled $58,085,769, compared with $59,316,290, in 1956. In the company's annual report, it was stated that earnings were reduced by competitive pressures on selling prices, curtailed operations, increased production costs and the expenses of a one month strike at Painesville.

Electric Auto-Lite

► For 1957: Net income of $9,501,581, which is equal to $5.93 per share, compared with $2,345,887, or $1.46 a share, in 1956. Sales in 1957 totaled $267,326,870 compared with $231,587,694 the previous year. The 1957 earnings included a special credit of $1,944,637, or $1.21 a share.

Detroit Gasket & Mfg.

► For 1957: Net income of $400,476, which is equal to 51c per share, compared with $279,615, or 36c a share, in the previous year. Sales in 1957 totaled $37,469,780 compared with $39,510,262, the year before.

McNeil Machine

► For 1957: Net income of $3,354,363, which is equal to $5.55 per common share, compared with $3,073,733, or $5.07 a share, a year previous. Sales last year totaled $43,288,636, compared with $36,410,268 in 1956. Both sales and earnings rose to new peaks last year.

American Enka

► For 1957: Net income of $1,266,744, which is equal to 93c per share, compared with $2,338,088, or $1.72 a share in 1956. Sales in 1957 totaled $64,739,351 compared with $60,892,199 in the preceding year. The company states that principal factors contributing to lower earnings in 1957 included start-up losses of the company's new rayon staple plant, lower selling prices of all rayon yarns, higher rates of pay and raw material costs.

Wyandotte Chemicals

► For 1957: Net income of $6,843,077, which is equal to $4.44 per common share, compared with $4,985,738, or $3.13 per share, the year before. Sales in 1957 totaled $85,028,009, compared with $79,627,750, in the preceding year. The company reported that total assets at year's end amounted to $89,328,772, compared with $83,259,936 at the end of 1956. Sales and earnings last year increased to new records.

Thermoid

► For 1957: Net income of $996,930, which is equal to $1.09 per common share, compared with $1,871,632, or $2.13 a share, in 1956. Sales last year totaled $39,528,158 compared with $38,210,747 the year before. Thermoid stated that higher sales resulted mainly from acquisition during the year of Flexible Molded Radiator Hose manufacturing facilities in Danville, Ill.

Columbian Carbon

► For 1957: Net income of $4,253,119, which is equal to $2.64 per share compared with $4,834,356, or $3.00 a share, in 1956. Sales last year totaled $70,902,783, compared with $65,529,600 the year before. Current assets at year's end were $27,810,623 against $27,083,713 in the previous year and liabilities were $10,024,074 as opposed to $9,802,943 at the end of 1956.

B. F. Goodrich

► Three months ended March 31: Net income of $6,289,545, which is equal to 70c per common share, compared with $10,160,824, or $1.14 a share, in the corresponding period of 1957. Sales totaled $161,926,836 in the first three months of 1958, compared with $183,684,493, in the equivalent period of the preceding year.

Rome Cable

► Nine months to December 31: Net income of $931,000, which is equal to $1.66 per common share, compared with $1,716,000, or $3.08 a share, in the last nine months of 1956.

Collyer Insulated Wire

► For 1957: Net income of $661,416, which is equal to $4.41 per share, compared with $958,282, or $6.39 a share, in the preceding year.

Albert E. Myers

Named Shell Oil Section Head

► Dr. Albert E. Myers has been named head of the plasticizers and extending oils section for the Industrial Products Department of the Shell Oil Co., New York, N. Y., succeeding W. Wayne Albright, who has been promoted to the industrial products management staff in the company's New York Marketing Division. Starting his career with Shell in the company's California refineries, Dr. Myers later assisted in the development and promotion of Dutrexes on the West Coast. He was transferred to New York in 1949. Dr. Myers was active in the Northern California Rubber Group while on the West Coast and he has continued his association with the rubber and plastics industries through membership in the New York Rubber Group and the Rubber Division of the American Chemical Society. He is a fellow of the American Institute of Chemists and of the American Association for the Advancement of Science.

Goodrich Promotes Flynn

► B. F. Goodrich Chemical Co., Cleveland, Ohio, has appointed Clarence R. Flynn to head the Technical Department at the company's new general chemicals plant in Henry, Ill. He was formerly a senior technical man at the firm's Development Center at Avon Lake, Ohio, where he worked on synthetic fiber development. Mr. Flynn attended the University of Minnesota, where he received a B. S. degree in chemical engineering in 1944. The same year, he joined the Goodrich Technical Service Laboratory in Akron and in 1946, he was transferred to the Akron general chemicals plant as a junior technical man in chemical process development. Mr. Flynn was assigned to Avon Lake as a technical man in 1947 and became a shift technical foreman two years later in a semi-works production group. In 1953, he was promoted to a senior technical man and the following year was assigned to synthetic fiber development. He is a member of the American Institute of Chemical Engineers.

Introduces Carbomix Masterbatch

► Copolymer Rubber and Chemical Corp., Baton Rouge, La., has announced the allocation of $3 million for construction of facilities to produce a dry rubber product containing carbon black, tradenamed "Carbomix". The new unit for the manufacture of Carbomix, which has already begun on a small scale, is scheduled for completion in November. This expansion will increase plant production capacity by 20 per cent. It has also been reported that Copolymer is building a half-million dollar research laboratory along with the $3 million steam power generating unit.

Manufacturers of rubber products requiring black generally add the black themselves by milling it into the dry rubber. Addition of carbon black in the process of making dry rubber offers a higher quality, wear resistant product at lower cost, the company claims. Use of the new product will also permit producers of finished rubber products to increase throughput of their plants, to minimize warehouse storage and to maintain cleaner plants.

The company says that it has been working on the development of Carbomix on a laboratory, pilot plant and semi-commercial scale for some time, investigating a number of methods of producing black master-batch in order to develop a better production method. The pilot plant has also made several extended runs to produce sufficient material for extensive laboratory, factory and actual road condition testing of tires. According to Copolymer the result was the manufacture of tires with tread wear resistance believed to be superior to those produced by the conventional dry black mixing method.

Akron Offers Elastomers Course

► The Institute of Rubber Research and the Department of Chemistry of the University of Akron will again offer this summer a one-week intensive course on elastomers, from June 9 to 14, for scientists and engineers employed in industry and business. The course will be limited to 25 persons. Closing date for applicants was to have been May 15. Lectures will be given from 9 a.m. until noon, and from 6:30 to 8:30 p.m. Laboratory meetings will take place afternoons from 1:30 to 4:30 p.m. The course schedule is as follows:

Monday: "Some Aspects of Tree Rubber," by G. Stafford Whitby and "Chemistry of Synthetic Rubbers," by Maurice Morton.

Tuesday: "Chemistry of Synthetic Rubbers (Cont'd.)", by Maurice Morton.

Wednesday: "Physical Behavior of Elastomers: Elasticity Theory; Relaxation and Creep," by James P. Berry and Kenneth W. Scott.

Thursday: "Physical Behavior of Elastomers: Dynamic Properties," by Kenneth W. Scott.

Friday: "Physical Behavior of Elastomers: Tensile Strength; Reinforcement," by James P. Berry.

Saturday: "Chemistry of Vulcanization," by Maurice Morton."

Clifford H. Hardy

Appointed To RMA Post

► Clifford H. Hardy has been named secretary of the Mechanical Rubber Goods Division of the Rubber Manufacturers Association, Inc., New York, N. Y. Born in Dillon, S. C., Mr. Hardy attended the Bolles School in Jacksonville, Fla.; Davidson College, Davidson, N. C., and the University of South Carolina in Columbia, S. C. Organizations with which he was associated prior to his RMA appointment were T. C. McSwain & Co., as office manager; Carolina Ginners Association, Inc., as executive secretary; National Cotton Ginners Association, as executive vice-president, and Holiday Inns of America, Inc., where he served as director of public relations.

During his career, Mr. Hardy has also been a columnist for the Cotton Trade Journal, an international trade publication; a co-sponsor of the first Southeastern Gin Suppliers Exhibit in Atlanta, Ga., and a board member of the South Carolina Maid of Cotton Promotion. Mr. Hardy has made numerous appearances before congressional committees and has been active in the work of the American Red Cross and the American Cancer Society. Actively concerned with civic and social matters, Mr. Hardy is a member of the American Society of Association Executives, the U. S. Chamber of Commerce, the American Legion, the Memphis Press Club, Pi Kappa Phi Social Fraternity, the German Club and the Loyal Order of Moose.

Named Research Director

► John H. McKenzie, formerly chairman of the Research Committee of the American Can Co., has been named director of research and development for United Carbon Co., Charleston, West Va. A native of Indiana, Mr. McKenzie holds bachelor's and master's degrees in chemistry. Prior to joining American Can, he worked in research with Marbon Chemical Division of Borg-Warner Corp. and has had 21 years experience in the research field.

Don R. Kuespert

Named to Sales Development

► Assignment of Don R. Kuespert to a sales development territory centering around Akron, Ohio has been announced by the Elastomer Chemicals Department of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. Mr. Kuespert will work closely with DuPont rubber customers in evaluating new materials to determine commercial utility. He will assist in planning and executing field testing programs, market research activities and test selling. A native of South Bend, Ind., Mr. Kuespert received his bachelor of science degree in chemical engineering in 1952 from Purdue University. Since 1955, he has handled sales promotion and sales development assignments in the company's Wilmington headquarters. Prior to his move to Wilmington, Mr. Kuespert was located in the Elastomer Chemicals' Akron laboratory and at the rubber laboratory in Deepwater Point, N. J.

Data on Philprene Expansion

► According to the financial report recently issued by the Phillips Petroleum Co., an 88 per cent expansion in capacity of the Plains Synthetic Rubber Plant near Borger, Texas, and a 42 per cent addition to the adjacent butadiene plant were completed during 1957. Annual capacities are now 108,000 long tons per year for Philprene rubber and 112,000 short tons for butadiene. The report also indicated that the output of Philblack amounted to 221,000,000 pounds. Sales of Philblack in 1957 were above the previous year and were at the second highest annual volume.

Velsicol Names Executives

► Velsicol Chemical Corp., Chicago, Ill., has announced that E. T. Collinsworth, Jr., previously executive vice-president, has been named president, succeeding Joseph Regenstein, Jr., who has been named chairman of the board. John F. Kirk, vice-president and director of sales, has been appointed to the board of directors. Velsicol manufactures agricultural chemicals and industrial chemicals.

West Coast News

► Recent dedication ceremonies of the new Freedlander Research and Development Laboratories of the American Latex Products Corp., Hawthorne, Calif., marks the latest of a series of expansions by the Dayton Rubber Co. in plastic foams, adhesives, and foam rubber fields. Officials at American Latex, a wholly-owned subsidiary of Dayton Rubber, said the new laboratories will augment research and development facilities at Dayton, Ohio, and Waynesville, N. C. The 25,000 square foot, two-story laboratory was built to provide industry with complete facilities for basic research and product development of urethanes, said company spokesmen.

The new research center was named after A. L. Freedlander, chairman of the board of Dayton Rubber. In addition to expanded research in the fields of foamed and solid state plastics, the laboratory contains facilities to develop more precise quality control methods, organic analysis, and prototype fabrication. The building houses a complete scientific library, testing facilities and offices for engineers and technical personnel. One of the major reasons for locating the research facilities at Hawthorne is because of the large amount of aviation and missile work centered in this area. Both fields offer primary markets for urethanes.

► The April 1 meeting of the Los Angeles Rubber Group held at the Biltmore Hotel in Los Angeles, Calif., featured an address by M. L. Sagenkahn and R. D. Sullivan of the Shell Chemical Corp. on "Improved Black Masterbatches." This paper traced the recent history of improvements in black masterbatches, and outlined the research and development program which Shell Chemical has pursued at its Torrance plant since it was acquired from the government. The nontechnical portion of the meeting was addressed by Samuel Fisher Bowlby of the Shell Oil Co. who spoke on "Any Number Can Play."

► Frank E. Taylor Jr., quality control supervisor of Oliver Tire & Rubber Co. of Oakland, Calif., has been elected president of the American Institute of Industrial Engineers, San Francisco-Oakland chapter.

► Aubin-Lee Tex Corp., Gardena, Calif., has announced that W. J. Durkin and Harry Sugerman have become associated with the firm in the capacity of plant superintendent and sales representative, respectively.

► Charles A. Lindsay, formerly general manager of the Molded Products Division of Stauffer Chemical Co., Los Angeles, Calif., was promoted to the position of vice-president of the firm.

Edward P. Loftus

Appointed Marbon Representative

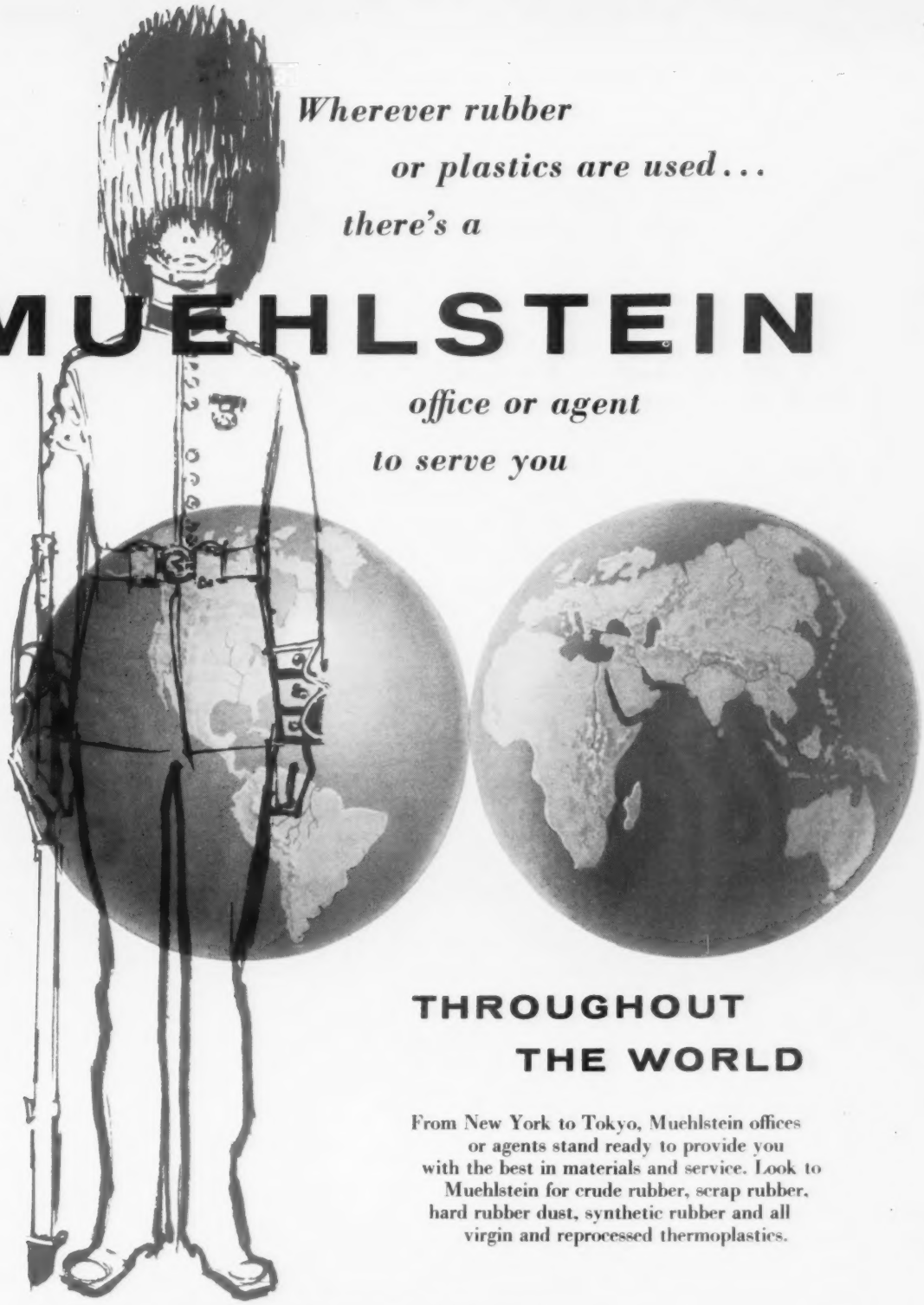
► Edward P. Loftus has been named a technical sales representative for Marbon Chemical of Gary, Ind., division of the Borg-Warner Corp., covering Missouri, Kansas, Oklahoma, Nebraska, Colorado and Texas. Before joining Marbon, Mr. Loftus spent two years selling bulk chemicals for the E. F. Drew Co. He has also been associated in a sales capacity with Swift and Co. and the Triangle Machinery Co. Mr. Loftus attended the University of Illinois, where he majored in commerce.

Buys Interest In Rex Corp.

► American Enka Corp., New York, N. Y., has acquired a controlling interest in the Rex Corp., West Acton, Mass., a producer of plastic covered wire and cable and ultra-high frequency insulating materials for the communications and electronics industries. The acquisition of Rex is the first step in a diversification program announced last year by American Enka, intended to broaden the company's base of operations in areas outside the textile industry. Rex will continue to operate under its present management as a subsidiary of American Enka. The company states that the acquisition results from a systematic study in which it was determined that the growth Rex has achieved, its potential for future expansion and broadening of its operations, present a particularly attractive opportunity for diversification of American Enka's interests outside the textile field.

Duffy Elected Vice-President

► Charles W. Duffy has been elected vice-president and director of the Standard Products Co., Cleveland, Ohio. Mr. Duffy was previously associated with the Kelsey-Hayes Co., Detroit, Mich., where he was in charge of sales to a major automobile manufacturer and also served as advertising manager. A graduate of Georgetown University, he served in the U. S. Army during World War II. Mr. Duffy has been associated with several civic organizations.



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Canadian News

► Polymer Corp., Ltd., has announced plans for the construction of a diversified pilot unit at its Sarnia, Ont., plant for further development and evaluation of new hydrocarbon rubbers, using stereospecific catalysts. Expected to cost more than $500,000, the unit will be sufficiently flexible to handle a wide range of hydrocarbons, many of which are already available in the Sarnia area. Products are expected to be useful for applications where high resilience is necessary and would supplement the styrene-butadiene and butyl types of rubber presently manufactured by Polymer. The company's Research and Development Division has been actively working in this field for several years. The new pilot plant will be supplemented by the $1,250,000 addition to the Polymer Research Laboratories.

In its annual report, Polymer announced that new records for production and sales have been reflected in a gross income of $74,615,000, an increase of 4 per cent over 1956. After providing $6,435,000, for income tax and $5,002,000 for depreciation, Polymer reported a net income of $6,823,000. Rising costs of production, some decrease in average price realization arising from the lower exchange premium on the Canadian dollar, and small price adjustments, resulted in a narrower profit margin than that achieved in the record year of 1956. Dividends of $2 per share were paid out of net earnings of $3.41 per share. The company states that during 1957, competition was intensified by the appearance of additional rubber supplies from newly expanded United States plants and a decline in the price of natural rubber. Capital expenditures of $6,598,000 were made in 1957 to maintain the plant at maximum efficiency and to provide for increased capacity.

► More than 1,500 chemists, chemical engineers and others engaged in kindred activities are expected to attend the 41st Annual Conference and Exhibition of the Chemical Institute of Canada, to be held at the Royal York Hotel, Toronto, on May 26 to 28, 1958. The Exhibition consists of the latest developments in laboratory and chemical process equipment, scientific instruments, chemicals and technical literature. Fifty-five manufacturers and distributors will take part in the display.

A feature of this conference will be the presentation of the Chemical Institute of Canada Medal to Dr. Carl A. Winkler, McGill University, Montreal, Que., in recognition of his outstanding contributions to chemistry. Dr. Winkler's Medal address will be "Active Nitrogen". The Merck Lecture, entitled "Recent Progress in the Synthesis and Structural Analysis of Polynucleotides" will be delivered by Dr. H. G. Khorana of the British Columbia Research Council, Vancouver, B. C. Merck & Co., Ltd., sponsors this lecture each year in order to bring distinguished scientists to address the conference. T. W. Smith of Montreal, Que., will be the recipient of the Montreal Medal, which was established in 1956 as a mark of distinction and honor to a resident of Canada who has shown significant leadership in or has made an outstanding contribution to the profession of chemistry or chemical engineering in Canada. Mr. Smith, now retired, was formerly associated with Canadian Industries, Ltd.

► The annual report of DuPont of Canada (1956) Ltd., Montreal, Que., disclosed that the company spent $14,664,000 in construction expenditures. These included the completion of the "Orlon" acrylic fiber spinning plant at Maitland, Ont., and of the commercial explosives plant near North Bay, Ont.; a major expansion of nylon facilities at both Maitland and Kingston, Ont., and construction of a hydrogen peroxide plant at Maitland. At year end $11,913,000 remained unexpended on projects under construction, including the hydrogen peroxide and acrylic polymer plants. By the end of 1958, projects totaling $43,000,000, all authorized since July 1, 1954, will have been virtually completed, according to the company. The report states "Although general business conditions for the present and immediate future are more uncertain than in recent years, the company's confidence in the future growth of Canada is reflected in plans to continue with diversification into those fields where its experience and technical knowledge offer a reasonable expectation of success."

► Goodyear Tire and Rubber Co. of Canada, Ltd., plans to build a $2,500,000 warehouse and office plant at New Toronto, Ont., which will comprise a one-story warehouse with a second-story office section and will cover 375,000 square feet. The company recently sold its holdings at Fleet-Bathurst Sts. to Molson's Brewery (Ontario) Ltd., but will continue to occupy the buildings there until it is ready to move into the new Toronto plant.

Goodyear has also announced that profits in 1957 were adversely affected by increased manufacturing and distribution costs, while prices were under pressure from competitive conditions prevailing in the industry. Goodyear said the company's sales volume reflected the decline in auto production and the rate of industrial expansion during the latter part of the year. Directors of the firm expect current economic difficulties facing Canada to be of short duration.

► Gutta Percha and Rubber, Ltd., has announced the appointment of John C. Henderson as general merchandising manager and Fred P. Shand as general sales manager. Mr. Henderson was graduated from the University of Toronto.

John A. Davis

Named Sales Representative

► American Cyanamid Co., New York, N. Y., has announced the appointment of John A. Davis as a sales representative in the metropolitan New York area for the company's Pigments Division. Formerly with the Division's Piney River, Va., plant, Mr. Davis has been with Cyanamid since 1949, when he joined the company as an engineer at Piney River. He is a graduate of Virginia Polytechnic Institute and a member of the American Institute of Chemical Engineers.

Allied Chemical Changes Name

► Allied Chemical & Dye Corp., New York, N. Y., has changed its name to Allied Chemical Corp. in order to more clearly reflect the broad nature of the company's position in the chemical industry. Allied Chemical president, Glen B. Miller said that the shorter name will be better "adapted to indentify the company in its public and trade relations and in advertising its products but in no way implies lack of interest in our dye business." Allied chemical operates six divisions that have about 30,000 employees who produce some 3,000 products at more than 120 plants, laboratories, mines and quarries.

Correction

► The April, 1958, issue of RUBBER AGE contained an article relating to the forthcoming meeting of the Division of Rubber Chemistry of the Chemical Institute of Canada which is scheduled to be held on May 28. The article erroneously stated that the meeting will be held in Montreal. The meeting will actually be held at the Royal York Hotel in Toronto, Ont., Canada. We regret the error.

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Obituaries

Frank D. Ascoli

► Frank D. Ascoli, managing director of Dunlop Plantations, Ltd., until his retirement in 1955, died at King Edward VII Hospital, Windsor, England, on February 14. He was 74 years old. Mr. Ascoli was educated at Manchester Grammar School and at Exeter College, Oxford, before joining Dunlop in 1926. He became a director and technical adviser of the Dunlop Malayan Estates when that company was formed in 1939. During World War II, he was appointed Controller of Rubber at the Ministry of Supply and later became the Director of Rubber. In 1948 Mr. Ascoli was named to the Advisory Committee to the Secretary of State for the Colonies Advisory Committee on Labor. He was a member and later chairman of the Council of the Rubber Growers' Association, president of the Institution of the Rubber Industry, and chairman of the International Rubber Conference in London in 1948. Mr. Ascoli was awarded the Hancock Medal by the Institution of the Rubber Industry in 1954 for conspicuous services to the industry. He introduced the centrifuging process in Malaya in 1930 and developed latex from a laboratory process up to a production capacity of over 10 million gallons a year.

Harold A. Morton

► Dr. Harold A. Morton, president of Rubber Latex Products Co., Chemico, Inc., and the Harrison-Morton Laboratories, died in Akron, Ohio, on March 22 after an illness of two months. He was 67 years old. Dr. Morton was a chemist and chemical engineer in the rubber industry for 38 years. He received his bachelor's and master's degrees from Clark University in Worcester, Mass., and a Ph.D. in chemistry from the University of Pittsburgh before going to Akron in 1920 as a research director for the Miller Rubber Co. Dr. Morton was retained in the research department when the Miller Co. was absorbed by the B. F. Goodrich Co. in 1930. In 1939, he and the late Dr. M. M. Harrison, also a former Miller Rubber chemist, left and formed the Harrison & Morton research firm. Both the Rubber Latex and Chemico firms are offshoots from that original firm. Dr. Morton was a member of the American Chemical Society, the Akron City Club and the West Congregational Church. He is survived by his wife and a daughter.

Frank F. Meads

► Frank F. Meads, a chemist for Converse Rubber Co. of Malden, Mass., died on March 4. He was 58 years old. Mr. Meads had been employed by Converse Rubber for the past thirty years and had been an active member of the Boston Rubber Group.

Kenneth R. Brown

► Kenneth R. Brown, retired vice-president of Atlas Powder Co., died on March 18 at the Chester County Hospital, West Chester, Penna., following a long illness. He was 61 years old. He joined the Atlas Powder Co. as a chemist in the explosives experimental laboratory after graduating from Swarthmore College in 1918. His work with sorbitol, one of the company's best known products, won him the 1955 honor awards of both the Commercial Chemical Development Association and the American Chemical Society's Division of Carbohydrate Chemistry. Mr. Brown retired as vice-president and director of Atlas in 1956, after 38 years of service. He was a member of the American Chemical Society, American Association of Economic Entomologists, American Institute of Chemical Engineers, Electrochemical Society, American Society of Testing Materials, the Chemists' Club of New York, and the Philadelphia Union League. Mr. Brown is survived by his wife and three sons.

William M. Bechler

► William M. Bechler, retired assistant controller of the B. F. Goodrich Co., died on March 22 in the Akron General Hospital. He was 67 years old. Mr. Bechler retired from Goodrich in 1955 with 47 years of service. A life resident of Akron, he joined Goodrich in 1908 as a billing machine operator. In 1915, after a few years of office work, Mr. Bechler became a production manager in the Golf Ball and Molded Goods Department. In 1918, he organized the Central Cost Department at Goodrich. Later, he was named factory auditor and became assistant controller in 1927. Mr. Bechler had recently been elected president of the Ohio Shrine Association at its annual meeting in Toledo. He was a member of the National Association of Cost Accountants, the Camp Committee of the YMCA, the Portage Country Club and the First Methodist Church. He is survived by his wife and a daughter.

August M. Recker

► August M. "Gus" Recker, manager of field sales for the Aviation Products Division of the Goodyear Tire and Rubber Co., died on April 10 in Akron General Hospital after a long illness. He was 52 years old. Widely known in the aviation industry, Mr. Recker joined Goodyear's District Operating Department in 1926 at Jacksonville, Fla. In 1952, Mr. Recker was appointed manager of the Commercial Sales Department and became manager of field sales for the Aviation Products Division in June, 1957. He served for 11 years on the board of directors of the Aviation Distributors and Manufacturers Association. Mr. Recker leaves his wife and two daughters.

Henry O. Newman

► Henry O. Newman, a retired chemist of the B. F. Goodrich Co., died on April 10 in City Hospital, Akron, Ohio, after a long illness. He was 68 years old. Born in Ithaca, N. Y., Mr. Newman received his chemistry degree from Cornell University in 1913 and shortly thereafter, began working in the Goodrich laboratories. He left Goodrich in 1915, but returned in 1936, remaining with that firm until his retirement in 1956. Other firms with which he was associated were the Republic Rubber Co., from 1922 to 1926, and later the U.S. Rubber Co. An expert in compounding rubber, Mr. Newman made some important discoveries, and during World War I, he had the responsibility for many of the compounds going into war materials. Mr. Newman was a member of Alpha Chi Sigma, chemical fraternity, and Delta Upsilon, national social fraternity. He is survived by his wife.

Clarence J. Howell

► Clarence J. Howell, retired vice-president of the Pequanoc Rubber Co., died on April 4 in Chilton Memorial Hospital, Pompton Plains, N. J., after a short illness. Mr. Howell joined the Pequanoc Rubber Co. in 1912 as its first chemist. He became plant superintendent and later was elected vice-president. When he retired in 1947, plant employees presented him a 1,000 foot color film depicting his service at the plant. Mr. Howell was president of the Butler, N. J., Board of Education for 27 years and was one of the organizers and a charter member of the Butler Rotary Club. In 1952, he received the club's "Man of the Year" award. Mr. Howell attended Trenton State Teachers College and received a degree in chemistry from New York University.

Darwin A. Chase

► Darwin A. Chase, personnel manager of the Goodyear Tire & Rubber Co. of Valencia, Venezuela, died there March 28 of complications following an operation. He was 52 years old. Mr. Chase was a native of Hendricks, West Va. and attended Potomac State College before joining Goodyear in 1929. He was assigned to the Java plant in 1934 and returned to Akron two years later in a factory supervision position. In 1941 he was in charge of supervisional training at Goodyear Aircraft and became labor department manager there in 1942. He was assigned to the Argentina plant in 1948 as personnel manager and took over the Venezuela position in 1955. Mr. Chase is survived by his wife and two daughters.

Harry B. Viel

► Harry B. Viel, sales production manager for the General Cable Corp., New York, N. Y., died on April 19 at his home in Westfield, N. J., after a long illness. He was 56 years old. Mr. Viel had been associated with General Cable for 37 years. He is survived by his wife and a daughter.

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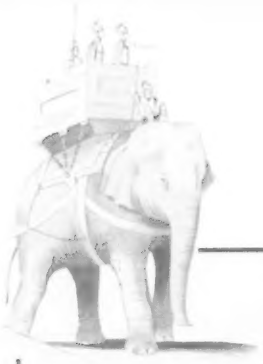

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Kosmos 20, Semi-Reinforcing (SRF) furnace carbon black, boasts by far the widest applications in various types of rubbers, and is indispensable to ever so many compounders.

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Overseas

Jakarta—War risk insurance rates to and from Indonesian ports have been reduced sharply. The rates per $100 of value have been reduced to 25¢ to and from the ports of Belawan Deli, Java and Borneo. Previously, the respective rates were $1.00, 75¢ and 50¢.

Bombay—National Rayon Corp., Ltd., will seek $2.1 million from private Indian investors to help finance construction of a $21 million, 4-million-pound per year, tire cord plant. The firm has already borrowed from the Export-Import Bank, from Rayon Consultants, a United States firm and from Industrial Credit and Investment Corp.

Singapore—A planting leader has made a strong attack on the National Union of Plantation Worker's Union, stating that the Union's wage proposals are the "most irresponsible" presented by a trade union to an employers' association. He said that if employers agreed to the proposal, they would survive the new wage rates for only a few weeks.

Ravenna—A butadiene-styrene synthetic rubber plant with an annual capacity of 35,000 tons was to have gone on stream in April. Constructed by Azienda Nazionale Idrogenazione Combustible, the plant will be operated under licenses from Union Carbide and Phillips Petroleum Co., both of which firms provided technical assistance, training and help in setting up the plant. By 1960, ANIC plans to construct a second unit scheduled to boost capacity to 55,000 tons.

Warsaw—Oswiecin (Auschwitz) Chemical Combine has started work on a synthetic rubber unit which will have an annual capacity of 36,000 metric tons. To manufacture semi-finished buna rubber, the unit will be outfitted by the U.S.S.R. and is scheduled to start production by mid-1960.

Rio de Janeiro—A $40 million government-owned synthetic rubber plant is in blueprint stage. Scheduled to produce 40,000 tons annually, the facility will probably be built near the government-owned Petrobras refinery, still under construction, near Rio de Janeiro.

Marl—A new butadiene-styrene synthetic rubber plant owned by Bunawerke Huels GmbH., will start production this summer. With an annual capacity of 45,000 to 50,000 tons, the new unit is expected to meet about 25 per cent of domestic rubber needs.

Paris—Societe Nationale des Petroles d'Aquitaine and Firestone Tire and Rubber Co. plan to build a 40,000-ton-a-year butadiene-styrene rubber plant in France. Firestone will provide know-how, financial aid and equipment, while the French firm will provide butane at a rate of 85,000 tons annually.

Rome—A new Italian company, Celene, has been organized by Union Carbide and Italian Edison Co. to produce high pressure polyethylene. The new facility will have an annual production capacity of about 24 million pounds a year. Edison has plans for the production of conventional polyethylene as well as vinyl.

Melbourne—Two American companies, Godfrey L. Cabot, Inc., and United Carbon, Inc., plan to build a carbon black factory near Melbourne. Expected to cost about $4,400,000, the projected plant will reportedly be the most modern factory of its kind in the world. At present, all Australia's carbon black supplies are imported.

London—Simon Handling Engineers has joined Rustyfa, the British consortium, which is to equip a complete Russian tire factory at Dnepropetrovsk. Simon will provide equipment worth about 2 million pounds, designed to meet the Russian stipulation that the degree of automation be at least equal to the latest practice in British, American and West German tire factories.

Moscow—It is reported that the Soviets have started pilot-plant production of "high-grade" *cis* 1, 4-polyisoprene, called "SKL", which contains 70 per cent *cis* and 30 per cent *trans* 1,4 compound. Of the remaining 10 per cent, 7-8 per cent is 3,4 and about 2 per cent is 1,2 isomer.

Melbourne—CSR Chemical Pty., Ltd., has announced plans to produce a high impact polystyrene plastic under license from Dow Chemical Co., in a new plant scheduled to begin production shortly.

Buenos Aires—Atanor, A. A., which will soon change its name to Plastics Atanor, Industrias Quimicas Argentinas, S. A., has completed an agreement with Vinyl Products, Ltd., England, for technical assistance in the manufacture of emulsions and solutions of vinyls, methacrylates and other materials for the rubber, textile, leather, paper and adhesive industries. A new firm, Monsanto-Andes, is being formed to manufacture vinyl materials in the province of Mendoza.

Jakarta—Current reports state that the blockade of central Sumatra has been lifted and that permission has been granted for the resumption of normal barter trade. Another report indicated that fair sized stocks of rubber were found in Pedang by the invading government forces. Details as to quantities, however, were not mentioned.

London—A new process for the production of synthetic rubber which is said to be radically different from other synthetic rubbers similar to natural rubber has been reported. The raw materials involved are said to be remarkably cheap and production costs are not expected to be expensive. Pilot plant production is expected to begin shortly.

This finely divided highly purified wood cellulose has many applications. It can:

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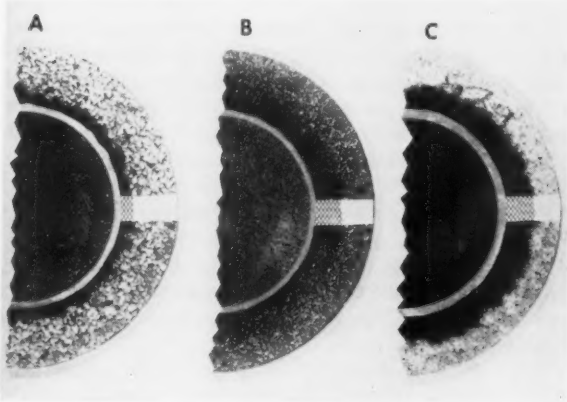
New Goods

Armstrong Uniphase Cork

► A new type of cork gasketing material, named "Uniphase Cork," made from a new continuous phase elastomeric binder that surrounds and embeds the cork particles, has been introduced by the Armstrong Cork Co. of Lancaster, Penna. Designed to eliminate seepage and leakage of liquids and gases in applications where neither cork composition nor cork and rubber have been completely satisfactory, the new gasketing material offers the optimum combination of impermeability, conformability and chemical inertness. Photo-



graphs of an oil penetration test taken through a glass flange show how Uniphase Cork compares with cork composition and cork and rubber gasket materials in resisting fluids under heat and pressure. In figure A, Uniphase Cork blocks flow of fluid practically at the inside perimeter of the gasket. Figure B shows penetration of fluid about one-third across the cork and rubber gasket, and Figure C shows oil penetration more than halfway across the cork composition gasket. Uniphase Cork has significantly greater resistance to contained fluids than other resilient gasket materials because the binder more closely approaches the chemical inertness of cork itself. Uniphase is extremely resistant to fungus attack and has ozone resistance in excess of the best non-metallic gasket materials specially compounded for this property.

U. S. Airmaster Rug Underlay

► A new flat sponge rubber underlay for carpeting and rugs called "U. S. Airmaster," has been developed by the U. S. Rubber Co., 1230 Ave. of the Americas, New York, N. Y. The Airmaster is a full 300 gauge (approximately 1/3 of an inch thick) made of highly resilient flat sponge rubber and having a tough, white fiber backing. The product is being manufactured in 36 and 53 inch widths. Other underlay products are Waffle, Airwave and Airland for use under carpets and rugs, and Non-Slip to anchor scatter rugs, oval braids, orientals and fiber rugs.

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Your compounding is the acid test for the claims of a supplier. Since their introduction to the market, United Clays have gained many supporters because of their uniformly close adherence to specifications on color, screen residue, and reinforcing characteristics.

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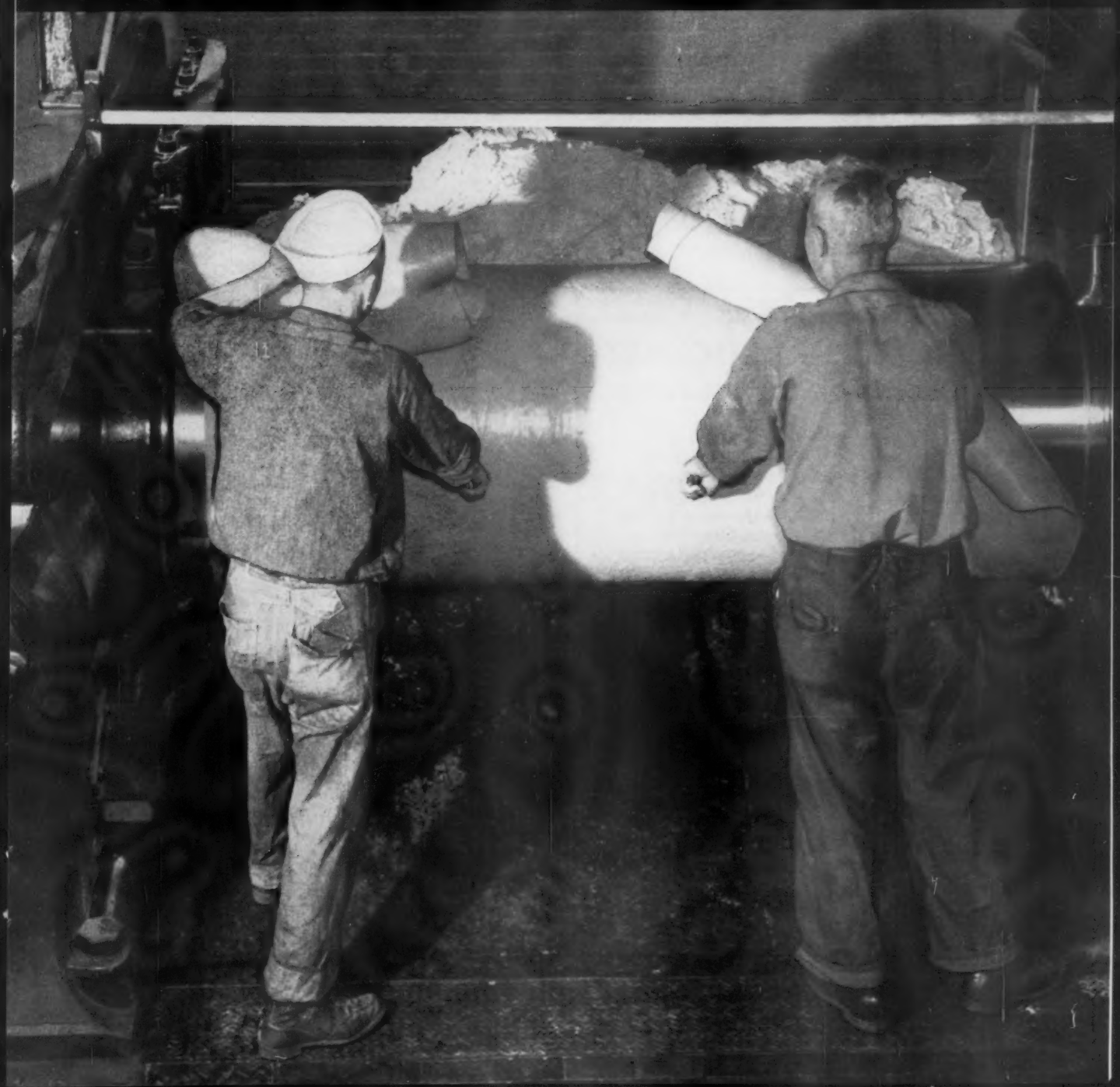
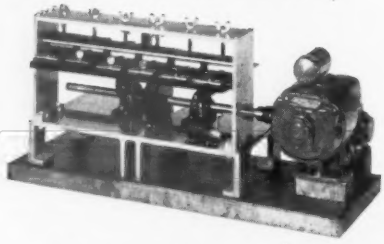
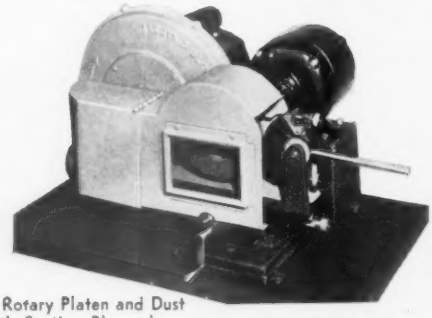


LABORATORY APPARATUS for the RUBBER INDUSTRY

ROSS RUBBER FLEXING MACHINE
(for ASTM D1052)



RUBBER SAMPLE BUFFING MACHINE



(Shown with Rotary Platen and Dust Collector with Suction Blower.)

EMERSON APPARATUS CO.
183 Tremont St., Melrose, Mass.

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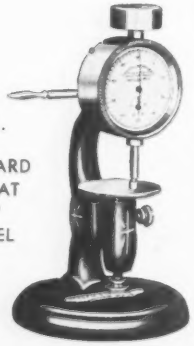
THICKNESS GAUGES FOR RUBBER



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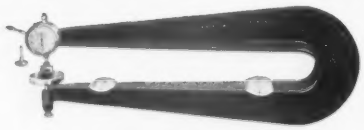
FOOT DIAMETERS
⅛" to 1¼"
ROLLS
Table and Roll or two Rolls
RANGE
½" or 1", also 1 CM Metric



26" DEEP THROAT MODEL

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248 Ash St., Waltham 54, Mass., U.S.A.

Stic-Klip Rubbair Doors

► Stick-Klip Manufacturing Co., Inc., 550 Regent St., Cambridge, Mass., has introduced the "Rubbair" door, which features a rubber construction and is said to be flexible, shock resistant, silent, light in weight, damage proof and safe in operation. For use in warehouses, supermarkets, hospitals, schools, restaurants, foundrys, loading platforms and similar applications, the door's cord construction offers better insulation and absorbs

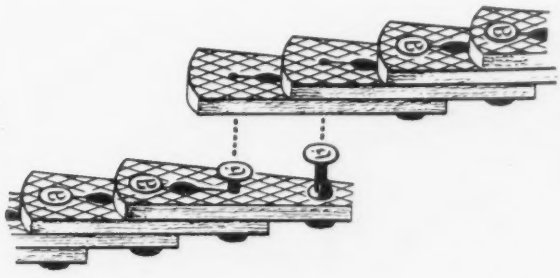
shock which would splinter or mangle conventional doors. Exterior casings of the Rubbair doors are 9/64 inch natural rubber (grease-resistant neoprene also available) reinforced with 2-ply, 15.4 ounce duck. The separators between the casings are solid rubber "H" extrusions 1½ x 1½ x ⅛ inches. The compartments between the extrusions are filled with pads of coarse, neoprene coated matting which forms a firm yet resilient structure, the volume of which is 90 per cent air. It will not disintegrate or collapse as a result of oxidation, nor will it slump or shift, the company states. It is further claimed that use of the Rubbair door eliminates constant replacement of torn hinges, sheared screws and shattered door frames and that the self-returning cam hinge is free from trouble under all conditions of operation. Single or double Rubbair door installations effect economies and reduce delays wherever mechanized material handling is important, Stic-Klip says.

Tesamoll Plastic Foam Tape

► United Mineral & Chemical Corp. of New York, N. Y. has announced production of a new urethane-foam tape for both commercial and domestic uses. Named "Tesamoll", the new tape is said to be resistant to oils and most chemicals, is highly resilient, and waterproof. It comes in rolls of ½ and ⅜-inch widths.

Dixlink V-Belts

► R & J Dick Co. of Passaic, N. J., has started production of "Dixlink" sectional type V-belts that are designed for quick and easy installation on V-drives of any length. The adjustable-length V-belts are being made for every size and kind of V-drive. Because of the adjustability feature, a single coil of Dixlink V-belt will often eliminate need for stocking scores of different lengths of V-belts of the same type. The Dixlink is made in special



oil, heat and fire resistant grades, as well as in the regular grade for general use. The illustration shows how belt links are separated and rejoined in the adjustable length V-belt being produced by the firm. Company officials said the Dixlink was designed particularly for fast and simple installation where an endless unit is not suitable due either to structural restrictions or fixed centers. The links are made to provide maximum power transmission efficiency for V-belt drives of from ½ to 1,000 horsepower.

Robbinette Composition Tile

► Introduction of the "Robinette Line"— an .08-inch gauge reinforced tile of composition rubber and plastic —has been announced by the Robbins Floor Products, Inc. of Tuscumbia, Ala. The new line is a homogeneous composition, designed for longer wear than similarly laminated flooring materials and priced to compete effectively with vinyl asbestos. According to company officials, the Robbinette line provides a highly-styled, high quality flooring at low cost. Strong, bright modern colors for the Robbinette line have been achieved by combining plastic with durable rubber. These colors have been selected in accordance with consumer preference data accumulated by Robbins during a two-year color research and testing survey. The nine scientifically selected marbleized colors are antique white, brown, gray, turquoise, green, red, coral, tan and black.

Goodrich Industrial Raincoat

► Development of a light but tough deluxe industrial raincoat, weighing about half as much as conventional lightweight raincoats, has been announced by B. F. Goodrich Industrial Products Co., Akron, Ohio. The two and one-half pound coat is made of Neoprene coated nylon fabric to assure exceptional tear resistance. Colored a high-visibility yellow, the new raincoat is offered as a companion garment to the company's deluxe work suit and is available in standard sizes.

Best scorch protection yet . . .

MAGLITE® D

The performance-proved magnesium oxide

Recent tests in the Merck Rubber Research Laboratories conclusively prove that MAGLITE D provides better scorch protection in neoprene compounds than other reactive magnesium oxides on the market. Additionally, it occupies only about one-third the warehouse space as many of the lightweight, reactive magnesium oxides. You can always count on uniformity of chemical and physical characteristics, ease of dispersion, practical cure rates, and speedy delivery when you specify the MAGLITE brand. MAGLITE D is ideal for compounding neoprene and Hypalon. MAGLITE K, L, or M is particularly well-suited for other elastomers and for certain product or process requirements. Stocks of all MAGLITE products are quickly available from 15 strategically located warehouses.

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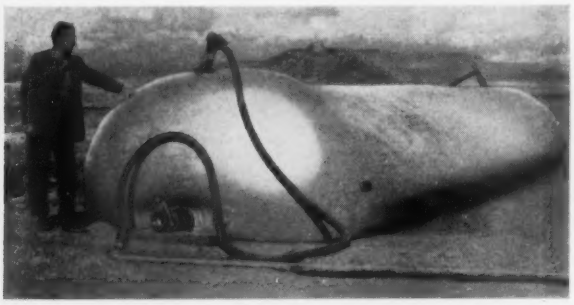
TRENTON 8, NEW JERSEY

Firestone Rubberized Tank

► Firestone Tire and Rubber Co., Akron, Ohio, has developed a lightweight rubberized fabric tank, called "Whale", which has a capacity of 15,000 gallons and is completely collapsible. When filled to capacity, the tank is 47 feet long, 11 feet wide and five feet high. It is constructed of two plies of nylon fabric, coated with a special neoprene compound to protect against abrasion and harmful effects of changing atmospheric



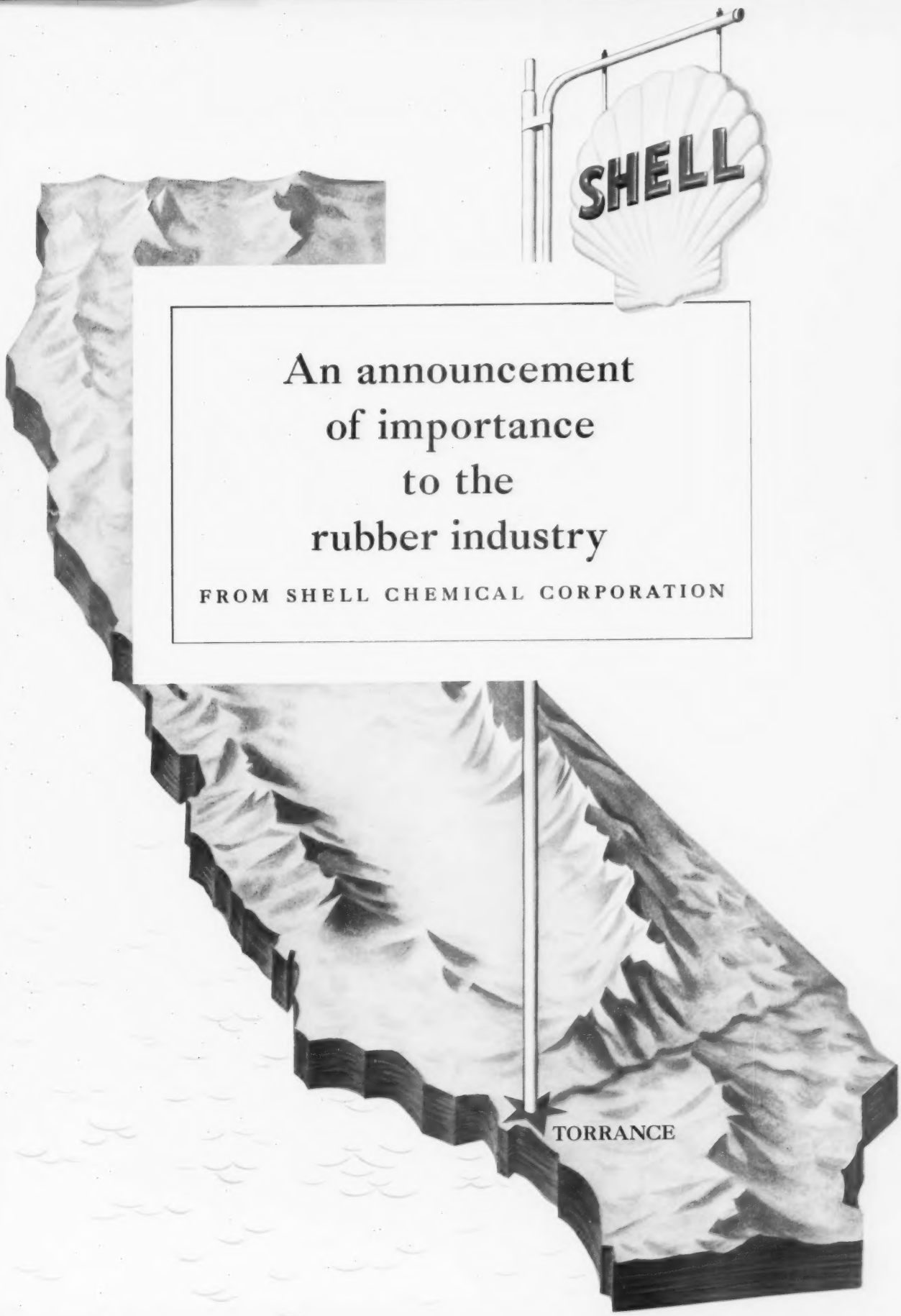
conditions. The tank is D-shaped in cross-section when full, and is equipped with an internal system of flexible stabilizers which prevent rolling on hilly terrain. Manufactured at the company's Magnolia, Ark., plant, a Whale can be rolled up into a package eight feet long by two and one half feet in diameter and weighs only about one tenth as much as a steel tank with comparable capacity. A small truck will carry seven of the empty "Fabritanks", which represent a total capacity of 105,000 gallons.

Technical Rubber Offset Blanket

► Technical Rubber, Inc., 151 Orange Ave., West Haven, Conn. manufacturers of air retaining fabrics for such items as boat fabrics, balloon fabrics, life vest and bladder materials, has announced that production has started on a new offset blanket in three ply and four ply construction. Sold under the trade name "Tech-Tarp", Technical Rubber neoprene coated nylon fabrics are widely accepted for such end uses as tarpaulins, construction and equipment covers, and field covers. Company officials stated that the new offset blanket is made from a neoprene-nitrile rubber blend and the fabric is a special high quality material woven from long staple domestic and imported cotton fibers.

U. S. Rubber Package Conveyor

► U. S. Rubber Co., New York, N. Y., has introduced a conveyor belt that can carry cartons up slight inclines and yet is said to slide easily beneath packages when a gate is used. Called the "U. S. Perfection Package Conveyor Belt," the belt features a folded edge construction utilizing three, four or five plies of 28 or 32 ounce cotton duck. A black friction surface on both sides enables the belt to slip beneath packages, thus preventing materials from piling up and jumping the gate. The belt can also be used for slider service where it operates over a hard wood or metal surface.



An announcement of importance to the rubber industry

FROM SHELL CHEMICAL CORPORATION

Shell Synthetic Rubber is now available in the

FLOTAINER*

A practical answer to the cold flow problem in shipping and storing synthetic rubber

For many years industrial users of general-purpose synthetic rubber have fought handling, storage and product contamination problems resulting from cold flow.

Now—after months of actual on-the-job testing—Shell introduces the Flotainer*—a major step forward in the application of modern packaging and handling methods.

The FLOTAINER* is a strong, lightweight, steel-strapped wooden container reinforced at strategic points to withstand the heavy pressure of settling bales. By controlling cold flow, it prevents bale deformation and film rupture during the critical storage and shipping periods.

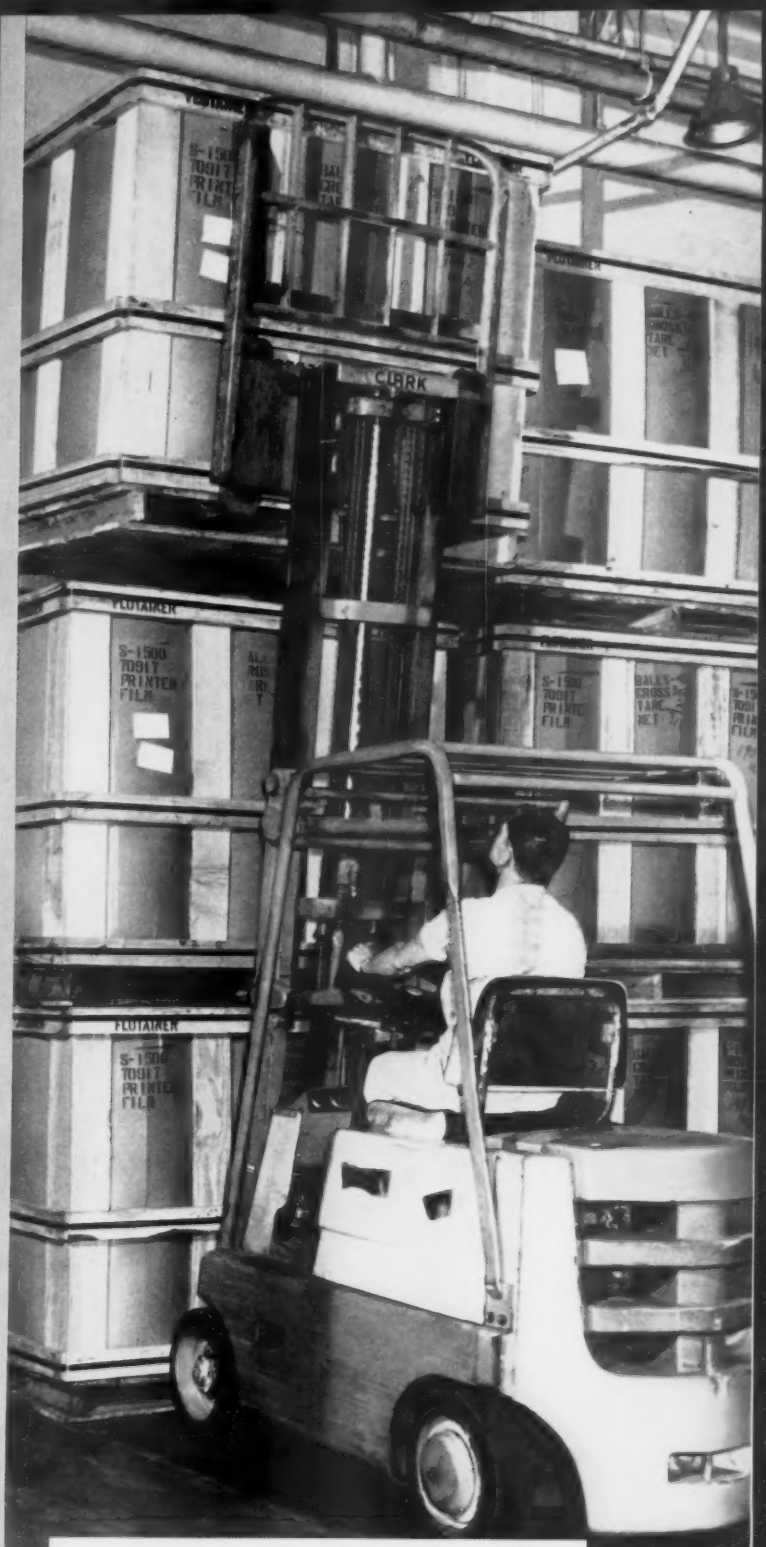
*Shell Chemical Trademark. Patents pending.

Ready for shipment. On its returnable pallet, the Flotainer contains 42 film-wrapped bales . . . 1½ tons of Shell synthetic rubber.

Detail of corner construction.
3 steel straps hold sides together.
3 snips . . . and the sides fall off.

Easy to unload. Standard fork-lift equipment unloads a flat-bed truck in less time than it takes to clear the gate house in some plants.

Easy to open. Sides and cardboard liner are easily removed. Side panels stack neatly for return trip.



Easy to store. Three-high stacking puts twenty tons of rubber on less than 100 square feet of floor space.

Easy to move. Pallet load retains compacted shape for some time after removal of sides. Nothing but the pallet and a single sheet of heavy paper goes to the Banbury room with the rubber.

En route by truck, Shell synthetic rubber in Flotainers leaves Shell's Torrance plant. Fifteen Flotainers—over 20 long tons of rubber—on a single flatbed truck.

En route by freighter, a Flotainer loaded with Shell synthetic rubber is hoisted easily to the ship's hold for an overseas destination.

En route by railroad, Flotainers provide security against deformation and contamination in transit, simplify loading and unloading.

THE FLOTAINER was developed at Shell's Torrance, California, plant

Here Shell Chemical produces a wide range of butadiene-styrene synthetic rubbers. These include hot, cold, oil-extended and black masterbatch rubber, as well as hot and cold latices. Our Technical Service Laboratory is ready to work with you in determining which Shell rubber best serves your purposes.

Get the complete story about Shell synthetic rubber. Phone or write for a catalog—or visit us at Torrance, California.

SHELL CHEMICAL CORPORATION

Synthetic Rubber Sales Division
P.O. Box 216, Torrance, California
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SHELL

Non-Migrating Antioxidant for Neoprene Skins

► Transfer-staining of light-colored enamels and lacquers caused by the intimate contact of Neoprene-covered weather strips has been brought under control by Hood Sponge Rubber Company. Hood's sponge rubber moldings, employing Neoprene skin, contain Antioxidant 2246® which has proven highly effective in reducing the migration problems common to many other antioxidant types. The non-discoloring feature of Antioxidant 2246 also benefits the appearance of light-colored moldings, and its highly effective oxidation protection assures resiliency through many years of service life. Antioxidant 2246 has been offered for several years by American Cyanamid Company as a particularly effective, yet non-staining, antioxidant for a wide range of rubber applications.

Maximum Processing Safety with SAF and ISAF Blacks

► Increasing use of SAF and ISAF furnace blacks has raised problems of processing safety, particularly in natural rubber stocks for truck, heavy construction and airplane tires where the carbon black ratio often exceeds 50 parts per 100 parts rubber. The stiffness of such master batches results in higher processing temperatures, thereby seriously decreasing the margin of processing safety. To meet such problems, American Cyanamid's Rubber Chemicals Department has developed DIBS® Delayed Action Accelerator, the safest accelerator available today. Technical information on DIBS may be obtained from American Cyanamid Company, Rubber Chemicals Department, Bound Brook, New Jersey.

Stabilizer 46-33 for Synthetic Rubber

► Maximum stability and easier, more uniform processability are contributed to synthetic rubber polymers by a new, non-staining antioxidant, Stabilizer 46-33. Used in hot or cold SBR, Stabilizer 46-33 offers superior gel-inhibiting characteristics during drying and storage of the raw polymer and through the early stages of hot mastication.

Commercial and technical information about standard SBR types produced with Stabilizer 46-33 can be obtained from Cyanamid's Rubber Chemicals Department or your SBR supplier.

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Anyway you look at it, you can't buy better than Cyanamid's MBTS Pellets. Write for full technical information — or contact your local Cyanamid Rubber Chemicals distributor.

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Rubber Chemicals Department
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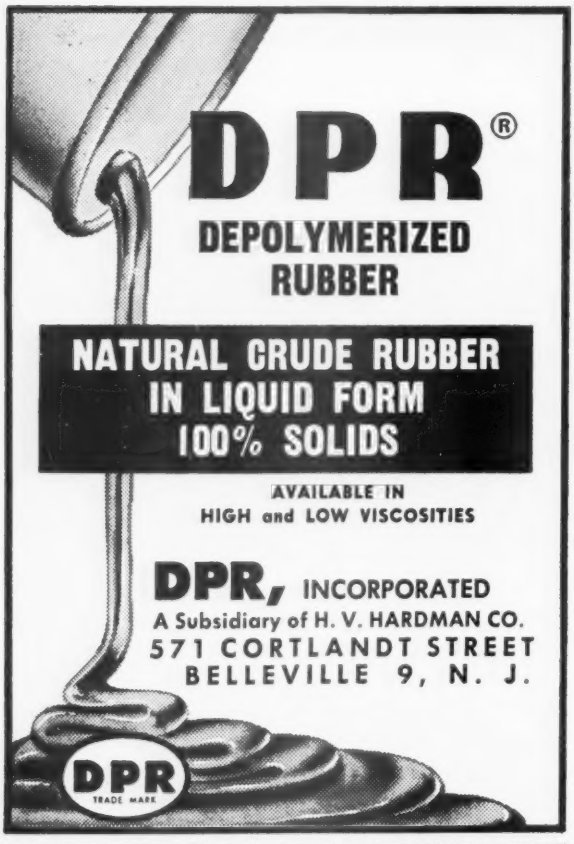

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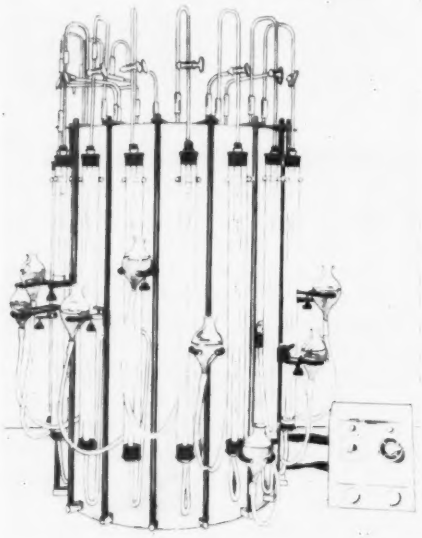

Brilmayer Electronic Metal Detector

► The Brilmayer electronic metal detector, manufactured by E. W. Brilmayer Laboratories, Inc., 86 Fulton St., New York 38, N. Y., features a magic arm device which automatically sweeps material containing metal off a conveyor without stopping the equipment. The magic arm is operated by an air cylinder which is controlled by a small solenoid valve energized by the metal detector. The detector comes on a stand ready for installation in a conveyor system. The stand can be furnished with or without its own conveyor belts, and with or without its own motor drive. The detector is effective with magnetic and non-magnetic metals.

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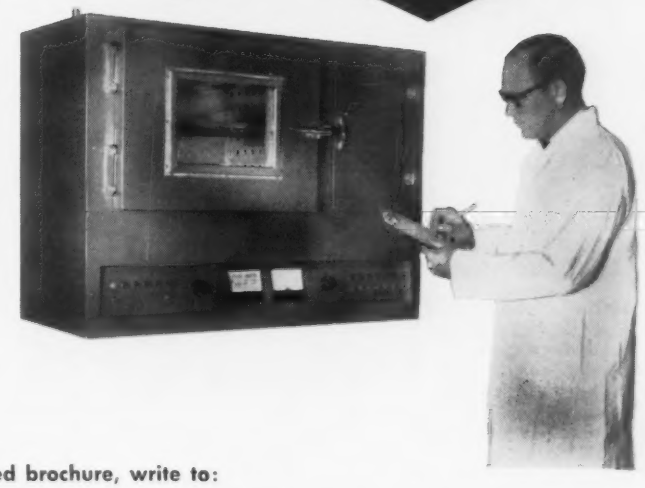

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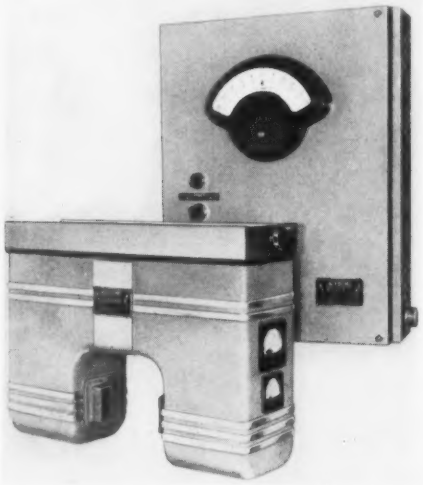
Electronic Gauge for Cable Diameters

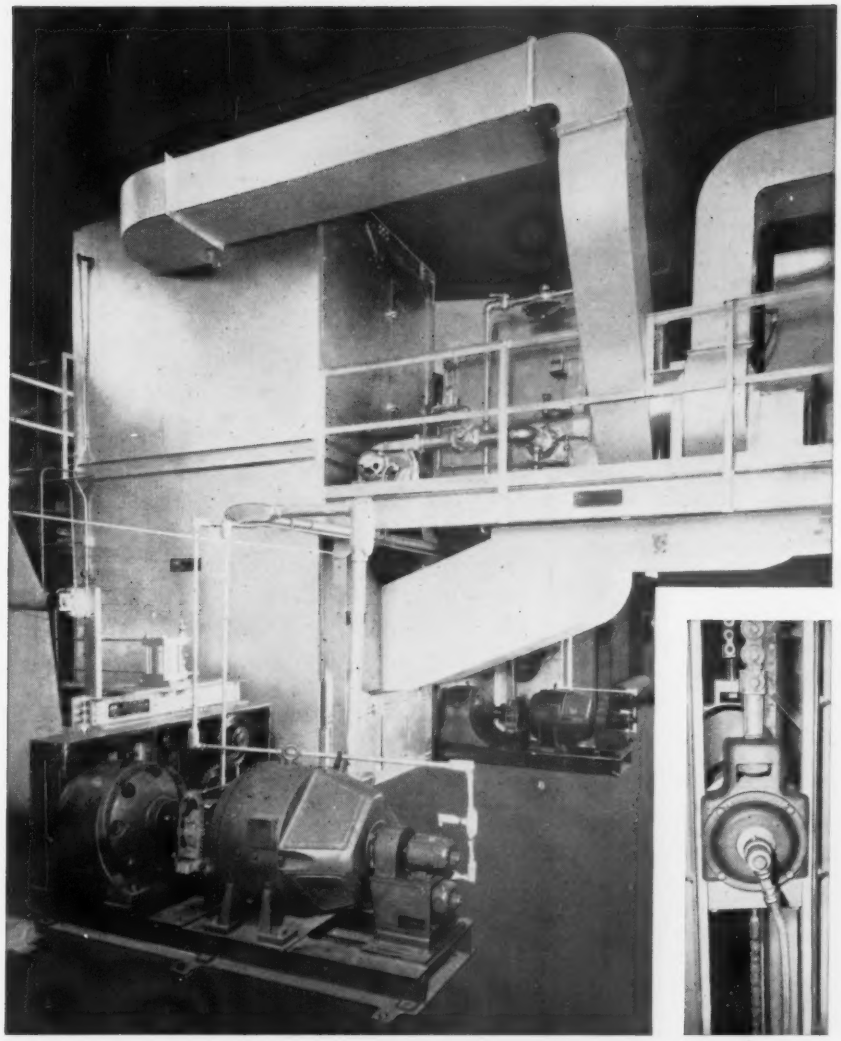
► Industrial Gauges Corp., West Englewood, N. J., manufactures an electronic gauge which continuously measures the diameter of insulated cable as insulation is applied, and controls production equipment to hold the diameter within close tolerances. The gauge conserves



insulating materials by preventing oversize diameters, and improves cable quality by avoiding undersize dimensions. Known as the Microlimit Control Cable Gauge, the instrument signals control equipment when diameter deviations exceed preset limits, and this equipment activates extruder or capstan so that more or less insulating material is applied as required. A strip chart recorder provides a continuous record of diameter deviations of all cable produced. The gauge, said to be accurate to within two thousandths of an inch, controls the application of rubber or plastic to cable ⅜-inch or more in diameter. The gauge does not contact the cable in any way and may be mounted less than 12 inches from the extruder, thus enabling corrective adjustments almost immediately when diameter deviations occur.

Thermistemp Temperature Controller

► Yellow Springs Instrument Co., Inc., Yellow Springs, Ohio, has released its new direct dialing Model 71 YSI Thermistemp temperature controller. The manufacturer says that this controller, which utilizes thermistor probes as sensing elements, can be set to any desired temperature from —6° to + 124°C. and the control point will be within 0.5°C. of desired temperature. When necessary the control temperature may be set more exactly by means of a vernier fine control in the instrument. Probes, including a 22 gauge hypodermic needle sensing probe, are available for control sensing in liquids, in gases, on surfaces and in semi-solids. By means of a barrier strip, different voltage heat sources can be activated, remote signalling arranged or different thermistor probes used to give the controller an arbitrary set range of —35° to + 220°C.



Within the first day of startup, full width nylon tire cord processed in this 30-yard-per-minute, 14,000-pound-tension **IOI** Rollevator® Oven*, was made into aircraft tires meeting all qualification tests.

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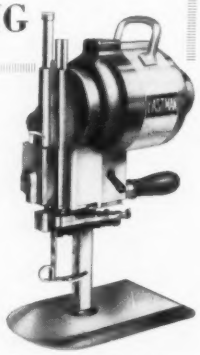

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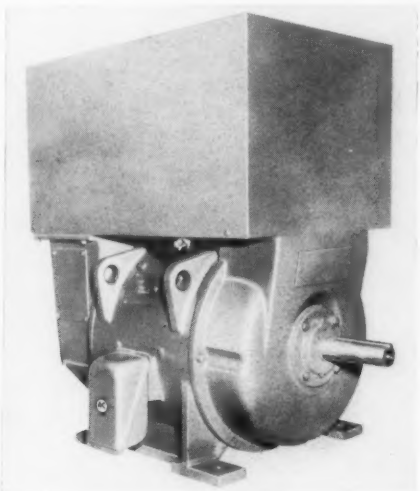
Allis-Chalmers Totally-Enclosed DC Motors

► A line of totally-enclosed motors with self-contained heat exchanger cooling for operation in highly contaminated atmospheres has been announced by Allis-Chalmers Manufacturing Co., Milwaukee 1, Wisc. Available in constant or adjustable speeds in frame sizes of



EB-120 and up in ratings from 10 through 200 hp, these motors are designed for rubber plants and other locations having airborne foreign matter. The motor's independent cooling system is unaffected by the speed of the motor, and a thermostatic relay in the hot air stream at the commutator end is designed to shut down the drive or operate an alarm in case of blower motor power failure. Wiring is made easier and inspection simplified by means of separate conduit boxes for the dc motor and the heat exchanger unit. Filters which can be cleaned during routine maintenance sift impurities from the outside air entering the heat exchanger.

Chemineer Rubber Cement Processors

► A new standard line of four rubber cement processors manufactured by Chemineer, Inc., 1044 East First Street, Dayton 2, Ohio, features processing time reductions, said to be as much as 50%, due to improved agitator design. In 50, 100 and 250-gallon sizes a single agitator with a special impeller is employed, giving the desirable advantage of high shear with low fluid displacement. Twin agitators are furnished on a 500-gallon unit. All units are fully jacketed for cooling and are equipped with flush bottom valves. Teflon cartridge seals are located above the nominal liquid level and are automatically scrubbed clean at the beginning of each cycle. Seal replacement is accomplished without removing any drive component. The processors are designed for freedom from maintenance, and are engineered specifically for processing rubber cement. The time-saving feature of the processors due to improved design is said to offer unique advantages.

Improved NRM Autoform Tire Vulcanizer

► National Rubber Machinery Co., Akron, Ohio, has announced the addition of two new design features to its line of Autoform tire vulcanizers. One, a slideback plate press design, provides for the upper set of molds to move back when the press is opened, giving unlimited head room and free access to the molds. This makes possible

easy and less expensive press loading arrangements, and provides for installation of automatic post inflators. The vulcanizer is furnished either as a conventional bladder type press, or with a new NRM bagless curing feature. It is equipped with automatic blow-off. The second feature, the bagless autoform, is said to be the first successful application of the bagless curing principle.

The improved unit incorporates a new type bead clamping device which permits using the tubeless liner of the tire being cured to hold the curing medium. Internal heating and curing is thus applied directly to the tire carcass. Elimination of costs in labor, materials and tire spoilage due to bladder failure is said to result in cost savings. Simple design of the new type bead clamp is said to assure positive action and minimum maintenance. It permits curing all passenger tire sizes of the same bead diameter with the same clamp ring by allowing for various bead ledge widths to accommodate changes in tire construction. The bead clamps are faced with specially compounded resilient material which is said to compensate for all normal variations in tire beads, thus providing for consistently perfect bead molding.

► A new **electronic integrator** with an extremely fast counting rate has been announced by Wheelco Instruments Division of Barber-Colman Co., Rockford, Ill. Developed for use in chromatographic applications to measure the relative quantity of components in gas mixtures, the unit is adaptable to other industrial processes where it is desirable to have the measured variable integrated.

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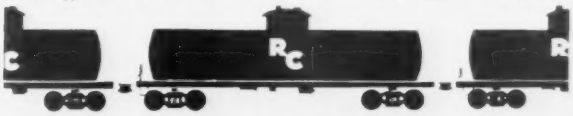

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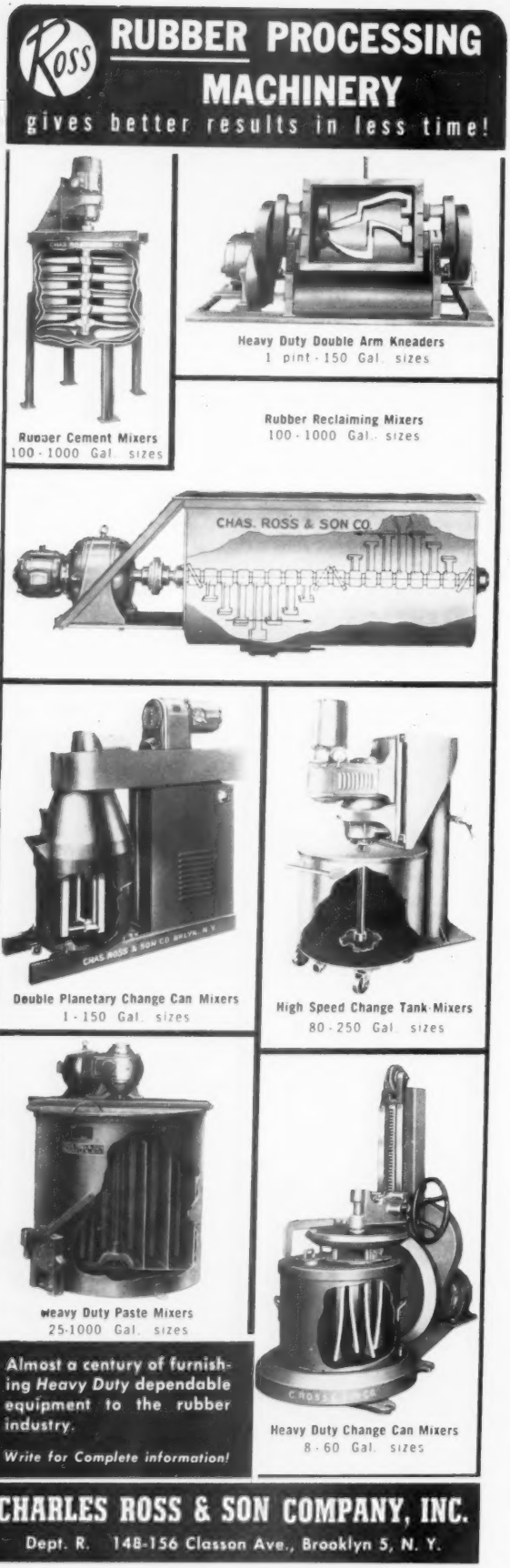
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Reviews

BOOKS

Report of the B.R.I. Plastics Study Group: Fourth Meeting. Published by Building Research Institute, 2101 Constitution Ave., Washington 25, D. C. 8½ x 11 in. 126 pp. $3.00.

The papers presented at the meeting of the Plastics Study Group of the Building Research Institute in St. Louis, Missouri, September 17-18, 1957, are reproduced in this publication. The first part of the book includes 12 informative technical papers dealing with, among other things, insulation, vapor barriers, flashings, surfacing materials and skylights. A number of these papers pertain to elastomeric materials and are of direct interest to the rubber industry: "Thermoplastic Foams as Thermal Insulation in Roofs," "Elastomer Modified Asphalts," "Neoprene as a Roof Coating," "Vinyl Film as a Roof Vapor Barrier," "Plastics Flashing Material" and "Sprayed Vinyl Coatings." Others of more general interest are on "Phenolic Foams in Thermal Insulation," "Architectual Requirements for Roofing Materials," and "Roof Structures Constructed of Plastics Materials."

The second section of the book presents a case study of the use of plastics materials for construction of the new Monsanto Chemicals Laboratory at Creve Coeur, Missouri, with reports by Monsanto personnel and their architects on design, management objectives and supervision, comparative costs of plastics and conventional materials and related subjects. The quality of the papers is high and the presentation attractive and legible.

•

The Pentaerythritols. By Evelyn Berlow, Robert H. Barth and John E. Snow. (American Chemical Society Monograph No. 136). Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 6 x 9¼ in. 318 pp. $10.00.

The published literature on pentaerythritol, dipentaerythritol and tripentaerythritol is surveyed and evaluated in this monograph. The preparation of these polyhydric alcohols and the formation, properties and uses of their derivatives are covered in detail. Recent developments in the field of alkyd resins, polyesters, polymeric acetals and ethers of pentaerythritol described in the book emphasize their increasing commercial applications. Pentaerythritol use in synthetic resins is also analyzed.

Applications in the synthetic rubber industry which are discussed include utilization of the acetal and acetal esters of the pentaerythritols as effective plasticizers, preparation of gels useful for compounding from a pentaerythritol ester of unsaturated fatty acids, and softening and tackifying synthetic rubber with pentaerythritol abietate butyral and pentaerythritol abietate benzal. The seventeen chapters of the book discuss all aspects of the material and its derivatives, and offer a brief summary of their various commercial applications. An extensive list of references follows each chapter, and an author index and subject index are included.

•

Oral Communication of Technical Information. By Robert S. Casey. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 5¼ x 7½ in. 200 pp. $4.50.

Methods of effective speaking for almost all situations are assembled for technical men in a "how-to" manner in this concise volume. Organization of material, composition, delivery of formal and impromptu speeches, and use of mechanical aids are among the subjects covered. How to preside at meetings, talk science to laymen and give technical legal testimony is also explained. One section reviews the most common errors in the speech-writing of chemists and engineers. A chapter of particular value is devoted to mechanical techniques, including the correct design and preparation of slides. A subject index pinpoints all the information, from abstract words to Zip-a-tone lettering for slides.

Free Radicals in Solution. By Cheves Walling. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 6 x 9¼ in. 632 pp. $14.50.

The author has attempted to fill an existing need for an up-to-date comprehensive survey of the field of organic free radicals in solution. A subject so complicated requires considerable arbitrariness as to organization and emphasis, and for this reason the author, as he explains in the introduction, has been guided by his own interest in reaction kinetics and in radical chain processes. Accordingly, after a brief historical introduction and consideration of the general physical and chemical properties of free radicals, he has summarized present knowledge of bond dissociation energies which determine the over-all thermodynamics of radical reactions.

Vinyl polymerization, discussed in Chapters 3 to 5, is chosen as the first class of radical reaction for detailed consideration and is used to develop the basic ideas of the kinetics of radical chain processes and the relations between structure and reactivity in radical reactions. In Chapters 6 to 9 the author applies the ideas developed in the discussion of polymerization to other radical chains, chiefly additions to double bonds, halogen substitutions and autoxidation processes. The two last chapters discuss a variety of non-chain processes in which radicals are produced by thermal dissociation of weak bonds, photochemical reactions and oxidation-reduction processes, and in other ways.

As an aid in tracking down topics which have been divided among different points of the discussion, the author has made an extensive use of cross references between sections. The literature appearing in major journals and *Chemical Abstracts* through June, 1956, has been covered, and a number of important subsequent references have been included. Extensive author and subject indexes close the volume.

Essentially, basic information and references which will enable a chemist to carry out intelligent research in the use of free radical reactions for synthetic purposes, in polymerization reactions and in halogenation, autoxidation and other reactions are given. The writing is clear and should be comprehensible to readers with a college-level knowledge of organic and physical chemistry.

•

Symposium on Radioisotopes. (ASTM Technical Publication No. 215). Published by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Penna. 6 x 9 in. 100 pp. $2.75.

The papers presented at the Second Pacific Area National Meeting of the American Society for Testing Materials in Los Angeles, Calif., September 21, 1956, are presented in full in this publication. Devoted to testing techniques utilizing radioisotopes and the wide range of industrial applications to which they may be put, the symposium offered information of direct interest to the rubber technologist. One of the papers, "Evaluation of Rubber Deterioration by Means of Phosphorus-32," deals with the uptake of radioactive tracers as a measure of rubber deterioration. Another, "The Problem of Establishing Specifications for Irradiated Organic Materials," presents data on butyl rubber and other polymers. Others of more general interest include: "Refinery Scale Applications of Radioactive Tracers," "Activation Anaylsis for Industry," and "Will ASTM Standards Be Influenced by Radiation Effects in Metals?". The application of radioisotopes in industry is finding increasing use. This book contains valuable information on a tool which offers a great potential for process and product improvements in the rubber as well as other industries.

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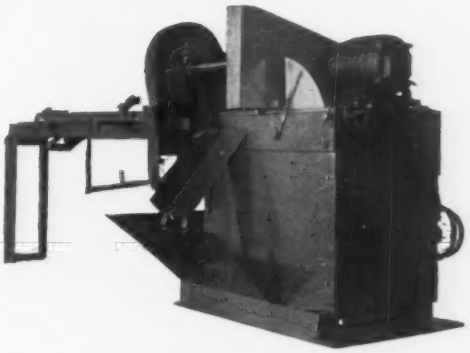

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BOOKLETS, CATALOGS, etc.

Note sul Calcolo del Pneumatico: la Geometria delle Strutture Interne. Parte Prima: Leggi Fondamentali e Progettazione. (Notes on the Design of Pneumatic Tires: The Geometry of the Internal Structure. Part I: Fundamental Law and Project. By Luigi Mario Amici. Pirelli Co., Milan, Italy. 8½ x 11 in. 40 pp. (In Italian).

In this research study, the author first reviews the principal problems which have to be met in the design of pneumatic tires, and then describes the more important laws governing the geometrical variations in carcasses of crossed angle type during the different stages of construction. Stress is laid on the laws which govern the cord angle at any point of the carcass, the width of the fabric in respect to the variation of the angle, and the end count in the fabric. How these basic and fundamental laws are utilized in the selection of tire building equipment is fully described. The second part of this report (now in preparation) will give further details of the fundamental laws, the design of the tire building equipment (i.e., drum width), and will offer a relatively simple slide-rule calculation method. The present report is replete with excellent schematics and includes three multi-colored illustrations depicting the construction of a typical tire.

•

Naugawhite. By M. L. Whitefield and R. R. Barnhart. (Compounding Research Report No. 41). Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn. 8½ x 11 in. 20 pp.

A comprehensive description of Naugawhite, the non-discoloring, non-staining, general purpose antioxidant for both dry rubber and latex recently introduced by the company, is contained in this research report. It is divided into two sections, the first devoted to dry rubber applications and the second to latex applications. In the dry rubber applications data are given on the use of the antioxidant in white natural rubber mold cured stock, in air and ammonia cured footwear stocks, in tire carcass compounds, and in neoprene and Paracril. Latex applications include use of Naugawhite in foamed latex. In all cases base formulas are shown with physicals listed. Naugawhite was formerly known as Experimental Antioxidant 421.

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Jackson Facilities and Products. Jackson Electronic & Manufacturing Co., 695 Johnston St., Akron 6, Ohio. 11 x 8½ in. 20 pp.

Illustrating the company's capabilities and diversified experience in the electrical and electronic fields, this brochure shows typical examples of test units and control assemblies engineered by the company for numerous military and industrial applications. It includes data on such items as motor generator sets, ground power systems, flight simulators and computer equipment developed for research, testing and production in the aircraft and missiles fields. Also shown are various control consoles, automation equipment and high voltage testing devices manufactured by the company for use in rubber and plastics production.

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A-C Polyethylene Lubricant 8417 in an Oil-Extended SBR Soling Compound. (Rubber Laboratory Release No. 2). Barrett Division, Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. 8½ x 11 in. 10 pp.

This booklet begins with a discussion of the general behavior of A-C polyethylene lubricants as processing aids, and details the advantages—including improved processibility, shorter milling cycles, and lower production costs—of using AC Polyethylene Lubricant 8417 in styrene rubber soling compounds. ASTM test procedures are listed, and basic formulas for four compounds with varying lubricant content are given. Physical test data are itemized for each of the stocks, and tension and hardness data are given for each at various cure times.

Goodyear Latex Types and Properties. Chemical Division, Goodyear Tire & Rubber Co., Akron 16, Ohio. 8½ x 11 in. 4 pp.

Goodyear latices are briefly outlined and described in this bulletin. Chemigum Latices (copolymers of butadiene and acrylonitrile), Pliovic Latex (a copolymer of vinyl chloride), Pliolite Latex 2000 series (rubber type latices of butadiene or of butadiene and styrene with high butadiene content) and Pliolite Latex 100 series (resin type latices of butadiene and styrene with high styrene content) are briefly analyzed in text and their properties and uses detailed in a table. The influences of each monomer on the properties of the copolymer are also analyzed. The tabular form used in presenting the 21 materials discussed makes for easy interpretation, and the listing of uses under each material is a valuable aid to those who work with the latices in various applications.

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Thiokol Polysulfide Polymers. (Bulletin No. 2-58). Thiokol Chemical Corp., Trenton 7, N. J. 8½ x 11 in. 8 pp.

A report of the results of current laboratory studies on Thiokol polysulfide liquid polymers is given in this bulletin. The studies include use of aluminum and carbonate-type fillers, additives for improved glass adhesion, toxicological effects and single package systems for caulking and sealing compounds. The aluminum filler evaluation covers 14 aluminum materials of which three are suggested for use in formulating aluminum-colored building sealants. Results indicate that five of six calcium carbonate-type materials tested can be used as fillers to obtain low-cost, light-colored sealing compounds. Data included show the feasibility of single-package compounds obtained by low temperature storage. Additives for improving the adhesion of sealants to glass and agents for masking the odor of polysulfide liquid polymer compounds are also listed.

Specifications for Rubber Products—Molded, Extruded, Lathe-Cut and Chemically Blown Sponge. Rubber Manufacturers Association, Inc., 444 Madison Ave., New York 22, N. Y. 8½ x 11 in. 52 pp. $1.00

This engineering data handbook on molded, extruded, lathe-cut and chemically blown sponge rubber products is designed primarily to aid the engineering and purchasing departments of the rubber goods industry's customers in improving specifications for their rubber component requirements. By establishing a "universal language" for use between supplier and user, the handbook should enable the manufacturer to determine more exactly what is actually described on his customer's drawings in terms of product tolerances, performance and service characteristics. Inasmuch as manufacturing techniques, capabilities, limitations and processing problems are different for each class of product, molded, extruded, lathe-cut and chemically blown items are treated in separate chapters. Each has its own charts, tables, illustrations and definitions. The technical committees of the RMA which worked on this handbook have made great effort to make it complete and accurate. It should lead to a better understanding between users and manufacturers of rubber products.

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Products of Atlas. Atlas Powder Co., Wilmington 99, Del. 8¾ x 6 in. 16 pp.

This booklet describes in brief the history of Atlas Powder, the company today, its major product lines, and the fields in which they are used. Chemicals manufactured include polyols, emulsifiers and activated carbons, as well as many others. The research and development program of the company is also explained. The presentation, which utilizes color and photographs, is unusually attractive.

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33 RECTOR STREET,
NEW YORK 6, N. Y.

MARKET REPORTS

TRENDS
NEWS
PRICES

Natural Rubber

Since our last report (April 1), the price of spot rubber on the New York Commodity Exchange has moved in the range of 250 points, high for the period being 27.13c reached on April 16, and low being 24.63c reached on April 30. The average price of spot rubber for the month of April was 26.44c based on 21 trading days. This compares with an average of 26.64c in the previous month.

With rubber prices at the lowest levels in the past four years with most grades selling substantially below synthetic rubber, there is a feeling in the trade that an upturn may be in sight for the natural rubber market.

Stocks Continue to Rise

Analysts at Merrill Lynch, Pierce, Fenner & Smith point out that stocks of natural rubber in this country continue to rise, with 113,000 long tons on hand at the end of March, against the 111,000 long tons on hand at the end of February and the 105,000 long tons in stocks at the end of January.

Based on present and near term expected rates of consumption, a figure of 90,000 long tons would be more than adequate. Fortunately for natural rubber, automobile production in Europe is continuing at a steady clip and setting new records in some instances.

In Indonesia, events suggest that the first phase of the rebellion may be nearing an end, MLPFS states, in favor of the Central Government. The possibility exists that if fighting is brought to an early end, prices for natural rubber may move to new lows. Many market observers look for a deterioration in the price level should Indonesian affairs be relegated to the background.

Domestic automobile production continues to slide and in the latter part of April was running at the lowest level since 1952. There is still a hope that an upward movement in automobile sales lies ahead and some dealers report a pick-up in used car sales.

Statistics in consuming areas abroad may not be so depressing as in the United States. However, synthetic capacity is being increased steadily all over Europe. This factor of extra capacity will loom ominously for some time to come unless 1959 or 1960 turn out to be banner years.

MLPFS analysts point out that until there is a definite ending to the current business slump, there will be little to give encouragement to natural rubber prices. A good boost in automobile sales or an eventual reduction of new car and tire inventories will, of course, be helpful.

Natural Imports Rising

Oddly enough, natural rubber imports into the United States rose in the first three months of this year compared with the like period of the previous year. RMA reports than 122,218 long tons were imported in the first three months of this year against 107,858 in the first three months of 1957. In the first three months of 1957, however, 105,686 long tons were consumed, contrasted with the 99,634 consumed in 1958.

NEW YORK, MAY 1, 1958

Price Data

Closing Rubber Prices on New York Commodity Exchange

FROM APRIL 1 TO APRIL 30

Apr.	Spot	May	July	Sept.	Nov.	Sales
1	26.63	26.50	26.55	26.60	26.60	9
2	26.63	26.62	26.70	26.70	26.71	26
3	26.63	26.45	26.50	26.50	26.50	14
4	....	....	....	....	....	..
5	....	....	....	....	....	..
6	....	....	....	....	....	..
7	26.63	26.50	26.50	26.50	26.52	28
8	26.63	26.50	26.55	26.60	26.60	6
9	26.75	26.65	26.70	26.75	26.75	26
10	26.75	26.70	26.80	26.80	26.80	20
11	26.88	26.90	26.90	26.90	26.85	47
12	....	....	....	....	....	..
13	....	....	....	....	....	..
14	26.75	26.75	26.75	26.75	26.65	34
15	26.88	26.80	26.80	26.75	26.72	23
16	27.13	27.10	27.00	26.95	26.90	44
17	26.88	26.80	26.80	26.75	26.75	46
18	26.88	26.90	26.82	26.80	26.72	39
19	....	....	....	....	....	..
20	....	....	....	....	....	..
21	26.63	26.65	26.60	26.60	26.50	31
22	26.50	26.45	26.35	26.35	26.25	79
23	26.50	26.45	26.40	26.35	26.30	24
24	26.25	26.15	26.10	26.05	26.05	100
25	25.63	25.50	25.50	25.45	25.40	148
26	....	....	....	....	....	..
27	....	....	....	....	....	..
28	25.50	25.30	25.35	25.35	25.35	57
29	25.50	25.38	25.30	25.30	25.25	116
30	24.63	24.35	24.55	24.60	24.60	83

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.24⅜
June	.24⅜
July-Sept.	.24⅜
Thin Latex Crepe:	
Spot	.26
Thin Brown Crepe, No. 2	.26¾
Flat Bark Crepe	.18

London Market
(Standard Smoked Sheets)

June	24.94 - 25.09
July-Sept.	24.94 - 25.09

Singapore Market
(Standard Smoked Sheets)

June	23.58 - 23.63

Middling Upland Quotations

	Mar. 31	Apr. 30		
	Close	High	Low	Close
May	35.98	35.97	35.90	35.95
July	36.23	36.42	36.28	36.40
Oct.	36.72	36.93	36.78	36.92

Notes & Quotes

A. J. Pickett, editor of *Rubber and Plastics Age (London)*, in his recent address before the CCDA meeting in New York observed that the amount of American synthetic rubber consumed in Europe during the next ten years is dependent on the job that American producers do in providing an assured supply at a price competitive with natural and backing this up with adequate technical data and service. If the American producer does not do this, the Communists will. The Soviet bloc is expanding its synthetic capacity and soon may have a surplus as large as 250,000 tons per year available for export. (See editorial on this subject elsewhere in this issue).

Synthetic Rubber

Karl O. Nygaard, director of business research for the B. F. Goodrich Co., speaking before the recent meeting of the Commercial Chemical Development Association in New York City, had some interesting facts to offer with reference to synthetic rubber. Mr. Nygaard pointed out that since World War II, natural and synthetic rubber have shared the growth in world new rubber consumption. There has been a trend toward increasing the usage of synthetic *but this has not really been at the expense of natural rubber.*

The speaker observed that natural rubber consumption is currently at about 1.9 million tons per year and that this is 75 per cent more than before World War II. Also, about all the natural rubber that can be produced today is being consumed. In effect, the development of synthetic rubber, he stated, rather than substituting entirely for natural, made possible the rapid growth in total world new consumption in the past fifteen years.

Synthetic Ratio Increasing

Mr. Nygaard noted that by 1957, 40 per cent of the world new rubber consumption was synthetic and the trend is for this percentage to increase gradually. This upward trend has been supported by a continuing increasing share of synthetic rubber in the U.S., from 52 per cent in 1954 to 63 per cent in 1957.

The big factor in recent years has been the greater use of synthetic rubber outside the U.S. The Free World, excluding the U.S., used very little synthetic rubber in the years immediately following World War II, but by 1956 the percentage was 20 per cent, rising further to 24 per cent in 1957.

Mr. Nygaard observed that there is very little information available about the ratio of natural to synthetic rubber in the Soviet bloc countries. It appears, however, that Russia uses about two-thirds synthetic and one-third natural. In the satellite countries, however, the ratio is about 25 per cent synthetic.

Total Soviet bloc consumption of new rubber is currently estimated at about 550,000 long tons per year with roughly 55 per cent of the total being synthetic rubber. The Soviet bloc countries account for about 17 per cent of total world new consumption, he stated.

World Capacity Ample

Mr. Nygaard is of the opinion that synthetic rubber capacity appears ample to handle the growth in world demand for years to come. U. S. capacity is now close to 1.6 million long tons with an additional 175 thousand ton capacity in the rest of the Free World. Consumption of synthetic rubber last year, excluding the Soviet bloc, totalled slightly less than 1.3 million long tons.

One of the principal features of the synthetic rubber supply situation in the next decade will be the rapid expansion in facilities abroad, where capacity will nearly triple. In the U.S., capacity is expected to rise to 1.7 million long tons by 1962.

MARKETS

(continued)

Reclaimed Rubber

The Rubber Manufacturers Association reports that in the first quarter of the current year a total of 59,978 long tons of reclaimed rubber were produced in the United States against the 72,664 long tons produced in the first quarter of the preceding year. RMA advises that as of March 31, 1958, a total of 59,066 long tons of reclaimed rubber were consumed in the United States, contrasted with the 71,325 long tons consumed in the first three months of the preceding year.

Thus it will be seen that both production and consumption of reclaimed rubber are running behind the previous years' totals. At the current rate, about 240,000 long tons of reclaimed rubber will be consumed in the United States in 1958. As of March 31, 1958, there were 28,588 long tons of reclaimed rubber in stocks, while on March 31, 1957, there were 30,975 long tons in stocks.

The picture for the balance of the year will depend, in great measure, on the general economy and on the activities of the automobile industry, in particular.

(Prices for All Areas Except Calif.)

	per lb.
Premium Grade Whole Tire	.11½
First Line Whole Tire	.11
Second Line Whole Tire	.10½
Third Line Whole Tire	.10¼
Fourth Line Whole Tire	.09¾
Black Carcass	.15¼
No. 1 Light Colored Carcass	.22
No. 1 Peel	.11
Butyl Tube Reclaim	.14
Natural Rubber Black Tube	.16
Natural Rubber Red Tube	.21
Natural Rubber Gray Tube	.21

Scrap Rubber

In the first three months of the current year, 53,533 long tons of scrap rubber were consumed in the United States according to the Rubber Manufacturers Association. At the end of the period, a total of 60,514 long tons of scrap rubber were in stocks.

There were few new developments in the scrap rubber market during the past period. One reclaimer opened his plant which had been closed for a time during the previous month, but this facility was not accepting tires and took only butyl tubes.

There have been no signs of any improvement in the scrap rubber market and trade factors are of the opinion that current depressed conditions will continue at least so long as the general business recession is in swing.

As for prices, a period of relative stability is at hand, with little change noted in quotations from the previous period. Current quotations follow:

(Prices Delivered Akron)

Mixed tires	ton	14.50
Light colored carcass	lb.	.04½
No. 1 peelings	ton	30.00
No. 2 peelings	ton	25.00
No. 3 peelings	ton	18.00
Buffings	ton	16.00
Truck and Bus S.A.G.	ton	19.00
Passenger S.A.G.	ton	17.00
Natural Rubber Red Tubes	lb.	.07½
Natural Rubber Black Tubes	lb.	.07
Butyl Rubber Tubes	lb.	.04¼

Tire Fabrics

According to recently published reports, nylon tire cord will represent 25 per cent of the total United States tire cord market by the end of the current year. This business has been gained at the expense of rayon, now taking 74 per cent of the market, and cotton, which is down to approximately 1 per cent.

Only six years ago, rayon took approximately 80 per cent of the market, cotton took 17 per cent, and nylon held 3 per cent. At stake is an estimated $275 million market—which is a measure of the concern evidenced by producers.

Many in the tire trade now believe that six out of ten replacement tires sold this year will be made with nylon cord. Nylon is also moving into the original equipment end of the market where, at the moment, rayon holds about 99 per cent of the passenger car trade. Here, however, nylon tire cords are being used in tires for limited production models and as optional equipment on the more expensive automobiles.

Promotion Budgets High

The American Rayon Institute has budgeted $1.75 million this year to promote rayon cord. On the other hand, such companies as DuPont are now making extra efforts to promote the use of nylon. At a recent press conference held in Wilmington, Del., DuPont officials indicated that the advertising and promotion activities for 1958 are the largest yet mounted in support of nylon cord.

DuPont officials noted that a steady increase in nylon cord sales has taken place since 1951, and poundage consumption of nylon cord in 1957 represented an increase of 23 million pounds or 36 per cent above the previous year. The increase in the number of nylon cord tires sold approached 65 per cent.

Other DuPont spokesmen pointed out that research carried out in the last several years led the company to conclude that nylon had certain advantages over rayon. The company also expects tire yarn will be a major market for nylon in the years that lie ahead.

Meanwhile, American Enka Corp. has announced that its total nylon capacity will be increased about 75 per cent and its capacity for the production of fine denier textile yarns will be almost tripled when the present nylon expansion program is completed by mid-year. In rayon tire yarn, on the other hand, the company reports that sales are running below estimates made earlier in the year.

(Prices f.o.b. Shipping Point)

Rayon Tire Cord

1100	lb.	.73
1650	lb.	.67
2200	lb.	.67½

Nylon Tire Cord

210	lb.	1.95
840	lb.	1.80

Rayon Graded Fabric

1100	lb.	.69
1650	lb.	.63½
2200	lb.	.63

Cotton Chafers

8.9 oz. (per square yard)	lb.	.68
9.25 oz. (per square yard)	lb.	.66
11.65 oz. (per square yard)	lb.	.62
14.4 oz. (per square yard)	lb.	.71

Liquid Latex

Natural: In the first three months of the current year, according to the Rubber Manufacturers Association, 17,879 long tons of natural rubber latex were imported into the United States. This compares with the 16,658 long tons imported in the first three months of the preceding year.

In the three-month period ending March 31, 1958, a total of 17,031 long tons of natural rubber latex were consumed in the United States, against the 20,072 long tons consumed in the first three months of 1957. As of March 31, 1957, there were 10,173 long tons of natural latex on hand, while one year later, there were 16,750 long tons in stocks.

This situation in natural latex is thus paralleling that of the general economy with reduced consumption and rising stocks. Natural rubber latex is now selling at about a 31-32c per pound level at East Coast ports in carload lots, so price is certainly no present obstacle to consumption.

The course which the natural latex market will take in the months that lie ahead is now hinged to the general economy. Factors not under the control of latex producers and consumers are now shaping the future and the latex market must, apparently, ride with the tide.

Synthetic: As we have previously commented in these columns, the relatively stable price structure which the synthetic latices have enjoyed over the past few years can no longer be considered as giving a competitive edge in any conflict with natural latex. The generally depressed state of the market has now brought about a situation in which the price levels of both types of latex are now about parallel. Even with this situation, however, neither type can be expected to move head rapidly because of the general economic conditions.

Cotton

The price of middling uplands on the New York Cotton Exchange has moved in the very small range of 15 points since our last report (April 1), high for the period being 36.10c reached on April 1, and low being 35.95c reached on April 8 and on eight other days during the month. The average price of middling uplands for the month of April was 36.00c based on 21 trading days. This compares with an average of 36.05c in the previous month.

The Agriculture Department has announced that it will operate a dual cotton export program during the new marketing year which will begin on August 1. This will include the present competitive sales plan under which government surpluses are sold to exporters at reduced prices for movement abroad.

In addition, there will be a supplemental plan under which subsidies—in the form of government-owned surplus cotton—will be offered to exporters to encourage them to buy and ship commercial supplies of cotton. This subsidy in kind would be designed to make up the difference between the domestic market prices of cotton and the lower world prices.

Under the present competitive sales program, all cotton destined for export first moves into government surplus stocks through the price support program and then is sold to exporters at reduced prices to enable them to meet competition from abroad.

PRICES OF COMMERCIALLY AVAILABLE SYNTHETIC RUBBER

Dry Rubber

(per pound carload)

Butadiene-Acrylonitrile Types

Butaprene NAA	.5400 [1]
Butaprene NF	.4900 [1]
Butaprene NL	.5000 [1]
Butaprene NXM	.5800 [1]
Chemigum N1	.6400 [2]
Chemigum N1NS	.6400 [2]
Chemigum N3	.5800 [2]
Chemigum N3NS	.5800 [2]
Chemigum N5	.5800 [2]
Chemigum N6	.5000 [2]
Chemigum N6B	.5000 [2]
Chemigum N7	.5000 [2]
Chemigum N8	.5000 [2]
Herecol N-33	.6800 [2]
Hycar 1001	.5800 [2]
Hycar 1002	.5000 [2]
Hycar 1014	.6000 [2]
Hycar 1041	.5800 [2]
Hycar 1042 and 1043	.5000 [2]
Hycar 1312	.5000 [2]
Hycar 1411	.6200 [2]
Hycar 1432	.5900 [2]
Hycar 1441	.6200 [2]
Paracril AJ	.4850 [2]
Paracril B	.5000 [2]
Paracril BJ	.5000 [2]
Paracril BLT	.5000 [2]
Paracril C	.5800 [2]
Paracril CV	.5900 [2]
Paracril D	.6500 [2]
Paracril 18-80	.6000 [2]
Polysar Krynac 800	.5000 [2]
Polysar Krynac 801	.5800 [2]
Polysar Krynac 802	.5000 [2]
Polysar Krynac 803	.5000 [2]

Butadiene-Styrene Types

Ameripol 1000	.2410 [2]
Ameripol 1001	.2410 [2]
Ameripol 1002	.2435 [2]
Ameripol 1006	.2410 [2]
Ameripol 1007	.2425 [2]
Ameripol 1009	.2475 [2]
Ameripol 1500	.2410 [2]
Ameripol 1501	.2410 [2]
Ameripol 1502	.2410 [2]
Ameripol 1703	.2060 [2]
Ameripol 1705	.2035 [2]
Ameripol 1707	.1910 [2]
Ameripol 1708	.1910 [2]
Ameripol 1710	.1885 [2]
Ameripol 1712	.1885 [2]
ASRC 1000	.2410 [2]
ASRC 1001	.2410 [2]
ASRC 1004	.2410 [2]
ASRC 1006	.2410 [2]
ASRC 1009	.2475 [2]
ASRC 1018	.2700 [2]
ASRC 1019	.2650 [2]
ASRC 1500	.2410 [2]
ASRC 1502	.2410 [2]
ASRC 1503	.2625 [2]
ASRC 1703	.2060 [2]
ASRC 1708	.1910 [2]
ASCR 3110	.2600 [2]
Baytown 1600	.1760 [2]
Baytown 1601	.1760 [2]
Baytown 1602	.1760 [2]
Baytown 1801	.1600 [2]
Copo 1500	.2410 [2]
Copo 1502	.2410 [2]
Copo 1505	.2610 [2]
Copo 1712	.1885 [2]
FR-S 1000	.2410 [2]
FR-S 1001	.2410 [2]
FR-S 1004	.2410 [2]
FR-S 1006	.2410 [2]
FR-S 1009	.2475 [2]
FR-S 1010	.2600 [2]
FR-S 1012	.2425 [2]
FR-S 1013	.2500 [2]
FR-S 1014	.2810 [2]
FR-S 1015	.2910 [2]
FR-S 1500	.2410 [2]
FR-S 1502	.2410 [2]
FR-S 1703	.2060 [2]
FR-S 1705	.2035 [2]
FR-S 1712	.1885 [2]
Naugapol 1016	.2650 [2]
Naugapol 1018	.2700 [2]
Naugapol 1019	.2650 [2]
Naugapol 1021	.3000 [2]
Naugapol 1022	.2800 [2]
Naugapol 1023	.2850 [2]
Naugapol 1503	.2625 [2]
Naugapol 1504	.2950 [2]
Philprene 1000	.2410 [1]
Philprene 1001	.2410 [1]
Philprene 1006	.2410 [1]
Philprene 1009	.2475 [1]
Philprene 1010	.2600 [1]
Philprene 1018	.2700 [1]
Philprene 1019	.2650 [1]
Philprene 1100	.1940 [1]
Philprene 1104	.1900 [1]
Philprene 1500	.2410 [1]
Philprene 1502	.2410 [1]
Philprene 1503	.2625 [1]
Philprene 1600	.1930 [1]
Philprene 1601	.1930 [1]
Philprene 1605	.1900 [1]
Philprene 1703	.2060 [1]
Philprene 1706	.2030 [1]
Philprene 1708	.1910 [1]
Philprene 1712	.1885 [1]
Philprene 1803	.1740 [1]
Plioflex 1006	.2410 [2]
Plioflex 1500	.2410 [2]
Plioflex 1502	.2410 [2]
Plioflex 1703	.2060 [2]
Plioflex 1710	.1885 [2]
Plioflex 1712	.1885 [2]
Plioflex 1773	.2060 [2]
Plioflex 1778	.1910 [2]
Polysar Kryflex 200	.2510 [2]
Polysar Krylene	.2410 [2]
Polysar Krylene NS	.2410 [2]
Polysar Krynol 651	.1885 [2]
Polysar Krynol 652	.1910 [2]
Polysar S	.2410 [2]
Polysar S-50	.2410 [2]
Polysar S-X 371	.2550 [2]
Polysar SS-250	.2875 [2]
S-1000	.2300 [2]
S-1001	.2300 [2]
S-1002	.2325 [2]
S-1006	.2300 [2]
S-1011	.2325 [2]
S-1013	.2300 [2]
S-1100	.1850 [2]
S-1500	.2300 [2]
S-1502	.2300 [2]
S-1600	.1825 [2]
S-1601	.1825 [2]
S-1602	.1825 [2]
S-1703	.1950 [2]
S-1706	.1925 [2]
S-1707	.1800 [2]
S-1709	.1775 [2]
S-1712	.1775 [2]
S-1801	.1675 [2]
S-1803	.1650 [2]
Synpol 1000	.2410 [1]
Synpol 1001	.2410 [1]
Synpol 1002	.2435 [1]
Synpol 1006	.2410 [1]
Synpol 1007	.2410 [1]
Synpol 1009	.2475 [1]
Synpol 1012	.2425 [1]
Synpol 1013	.2500 [1]
Synpol 1061	.2410 [1]
Synpol 1500	.2410 [1]
Synpol 1502	.2410 [1]
Synpol 1551	.2410 [1]
Synpol 1703	.2060 [1]
Synpol 1707	.1910 [1]
Synpol 1708	.1910 [1]
Synpol 1711	.1900 [1]
Synpol 1712	.1885 [1]

Butyl Rubbers

Enjay Butyl 035 and 150	.2300 [2]
Enjay Butyl 165 NS	.2400 [2]
Enjay Butyl 215	.2300 [2]
Enjay Butyl 217	.2300 [2]
Enjay Butyl 218	.2300 [2]
Enjay Butyl 268 NS	.2400 [2]
Enjay Butyl 325	.2300 [2]
Enjay Butyl 365 NS	.2400 [2]
Polysar Butyl 100	.2450 [2]
Polysar Butyl 101	.2175 [2]
Polysar Butyl 200 and 300	.2450 [2]
Polysar Butyl 301	.2550 [2]
Polysar Butyl 400	.2450 [2]

Chlorosulfonated Polyethylene

Hypalon 20	.7000 [2]
Hypalon 30	.7000 [2]

Neoprene

	(prices l.c.l.)
Neoprene Types AC and CG	.5500 [2]
Neoprene Type GN	.4100 [2]
Neoprene Type GN-A	.4100 [2]
Neoprene Type GRT	.4200 [2]
Neoprene Type KNR	.7500 [2]
Neoprene Type S	.4200 [2]
Neoprene Type W	.3900 [2]
Neoprene Type WHV	.3900 [2]
Neoprene Type WRT	.4500 [2]
Neoprene Type WX	.4100 [2]

Polysulfide Rubbers

	(prices l.c.l.)
Thiokol Type A	.4700 [2]
Thiokol Type FA	.6400 [2]
Thiokol PR-1	.9500 [2]
Thiokol Type ST	1.00 [2]

Silicone Rubbers*

	(prices l.c.l.)
GE (compounded)	2.50 [2]
GE Silicone Gum (not compounded)	4.00 [2]
Silastic (compounded)	1.90 [2]
Silastic (gums)	3.85 [2]
Union Carbide (gums)	4.00 [2]
Union Carbide (compounds)	2.50 [2]

Latex

(per pound carload)

Butadiene-Acrylonitrile Types

Butaprene N-300	.4600 [1]
Butaprene N-400	.5400 [1]
Butaprene N-401	.5400 [1]
Chemigum 200	.4900 [2]
Chemigum 235	.5400 [2]
Chemigum 236	.5400 [2]
Chemigum 245	.4600 [2]
Chemigum 246	.4600 [2]
Hycar 1512	.4600 [2]
Hycar 1551	.5400 [2]
Hycar 1552	.4600 [2]
Hycar 1561	.5400 [2]
Hycar 1562	.4600 [2]
Hycar 1571	.5400 [2]
Hycar 1572	.5100 [2]
Hycar 1577	.4600 [2]
Hycar 1852	.4600 [2]
Nitrex 2612	.4600 [1]
Nitrex 2614	.4600 [1]
Nitrex 2614-A	.4600 [1]
Nitrex 2315	.5100 [1]
Nitrex 2615-A	.5100 [1]
Nitrex 2516	.5400 [1]
Nitrex 2617	.4600 [1]
Nitrex 2617-A	.4600 [1]
Nitrex 2619	.5300 [1]
Nitrex 2620	.4600 [1]
Nitrex 2625	.4600 [1]

Butadiene-Styrene Types

Copo 2101	.3000 [2]
Copo 2102	.3200 [2]
Copo 2105	.3200 [2]
Copo X-765	.3000 [2]
FR-S 2000	.2775 [2]
FR-S 2001	.2775 [2]
FR-S 2002	.3000 [2]
FR-S 2003	.3050 [2]
FR-S 2004	.3050 [2]
FR-S 2006	.2900 [2]
FR-S 2105	.3200 [2]
Naugatex 2000	.2775 [1]
Naugatex 2001	.2775 [1]
Naugatex 2002	.3000 [1]
Naugatex 2006	.2900 [1]
Naugatex 2105	.3200 [1]
Naugatex 2107	.3200 [1]
Naugatex 2108	.3000 [1]

POLYMERS

Pliolite 2000	.2775 [3]
Pliolite 2076	.2900 [3]
Pliolite 2101	.2775 [3]
Pliolite 2104	.3200 [3]
Pliolite 2105	.3200 [3]
Pliolite 2107	.3250 [3]
Pliolite 2108	.3050 [3]
S-2000	.2275 [3]
S-2006	.2150 [2]
S-2101	.2250 [2]
S-2105	.3100 [2]
S-2107	.3200 [2]

Neoprene

Neoprene Latex 60	.4000 [2]
Neoprene Latex 571	.3700 [2]
Neoprene Latex 572	.3900 [2]
Neoprene Latex 601-A	.4000 [2]
Neoprene Latex 735	.3800 [2]
Neoprene Latex 736	.3800 [2]
Neoprene Latex 842-A	.3700 [2]
Neoprene Latex 950	.4700 [2]

Polysulfide Rubbers

Thiokol Type MX	.7000 [2]
Thiokol Type WD-2	.9200 [2]
Thiokol Type WD-6	.7000 [2]

Notes: (1) Freight allowed. (2) Freight extra. (3) Freight prepaid. *Covers a wide range of compounds. Readers are urged to check specific prices with producers.

SUPPLIERS

Are Your

Synthetic Rubbers

Listed

in This Section?

if not

Forward full information

to

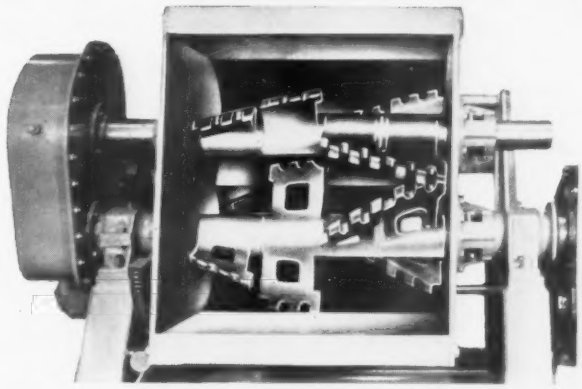
Market Editor

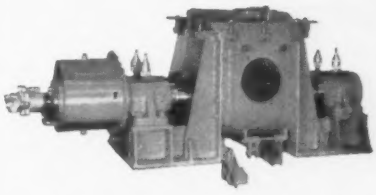
RUBBER AGE

101 West 31st St.,

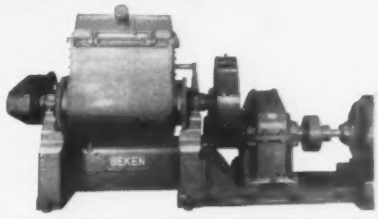
New York 1, N. Y.

Why It's BRAMLEY-BEKEN *Today*





All sizes — Heavy Duty — Bottom Discharge Trough.



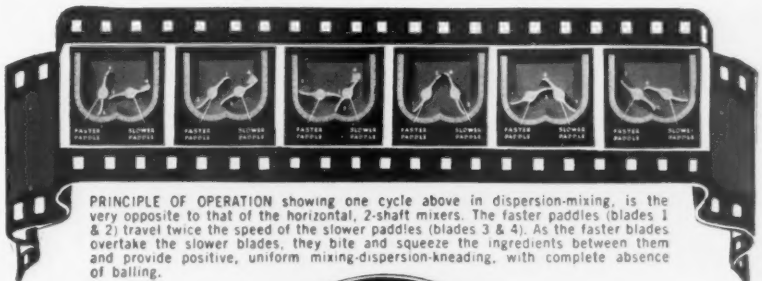
Gross Volume 100 to 300 Gallons inclusive — Motorized Tilted Trough — Direct Drive

Because MOST EFFICIENT . . . MOST ECONOMICAL . . . MOST PRODUCTIVE MIXER . . . DISPERSER . . . KNEADER

For Rubber Cement and Other Rubber Products

The Bramley-Beken cuts time tremendously! All power goes into productive work. Only that part of the mass being squeezed between the *multiple* paddle blades is worked on *at any one time.* Hence, saving in power per batch . . . increased productivity . . . less operating and maintenance costs . . . faster output . . . and a better end-product. The selection of the Bramley-Beken by America's top leaders has been the result. Laboratory and pilot test facilities are available.

How It Cuts 4-24 Hours to 1-4!



PRINCIPLE OF OPERATION showing one cycle above in dispersion-mixing, is the very opposite to that of the horizontal, 2-shaft mixers. The faster paddles (blades 1 & 2) travel twice the speed of the slower paddles (blades 3 & 4). As the faster blades overtake the slower blades, they bite and squeeze the ingredients between them and provide positive, uniform mixing-dispersion-kneading, with complete absence of balling.

RESEARCH MECHANICAL ENGINEERS DEVELOPMENT

Bramley Machinery Corporation

800 R **RIVER ROAD** **EDGEWATER, N. J.**

STATISTICS of the industry

PERTINENT INDUSTRY DATA

Natural Rubber in the United States

(Including Latex and Guayule)

(All Quantities in Long Tons)

Year	New Supply	Consumption	Re-Exports	Stocks On Hand at End of Period
1931	501,788	355,200	25,609	322,000
1932	414,668	336,700	20,937	379,000
1933	418,902	412,400	20,576	365,000
1934	463,018	462,500	23,856	355,000
1935	467,146	495,500	11,391	303,000
1936	488,143	575,000	12,582	223,000
1937	600,479	543,600	7,902	262,204
1938	411,983	437,031	5,652	231,500
1939	499,473	592,000	13,125	125,800
1940	818,243	648,500	7,060	288,864
1941	1,029,007	775,000	5,376	533,344
1942	282,653	376,791	10,856	422,714
1943	55,329	317,634	20,815	139,594
1944	107,834	144,115	9,665	93,650
1945	135,672	105,429	6,743	118,715
1946	400,687	277,597	4,338	237,467
1947	688,354	562,661	4,101	129,038
1948	735,227	627,332	6,673	141,541
1949	660,792	574,522	6,253	106,619
1950	802,249	720,268	8,644	89,215
1951	733,048	454,015	2,603	76,569
1952	805,997	453,846	3,024	95,260
1953	647,150	553,473	8,376	112,316
1954	596,848	596,285	7,443	104,543
1955	635,174	634,800	10,611	110,105
1956	580,510	563,095	11,300	115,949
1957	499,121	539,761	10,146	100,901
1957:				
Mar.	40,680	48,263	1,218	97,820
Apr.	59,896	45,368	530	102,796
May	52,566	46,385	738	98,817
June	30,290	41,282	859	90,694
July	44,760	39,789	483	98,871
Aug.	48,951	44,933	1,000	99,093
Sept.	44,188	43,675	780	103,233
Oct.	49,371	48,782	926	102,496
Nov.	44,583	43,696	1,225	97,754
Dec.	44,544	38,058	1,000	100,473
Dec.	44,544	38,285	1,003	100,901
1958:				
Jan.	38,289	42,597	1,000	104,979
Feb.	52,536	36,550	1,050	112,273

Source: U. S. Department of Commerce.

U. S. Imports of Natural Rubber

Year	Dry — Long Tons	Dry — Declared Value	Latex — Long Tons	Latex — Declared Value	Total Imports
1936	467,064	152,072,496	19,852	6,659,899	486,916
1937	574,600	237,307,041	23,185	10,213,670	597,785
1938	397,640	145,373,864	11,944	4,168,127	409,584
1939	469,946	167,586,780	27,437	10,467,552	497,383
1940	781,202	303,308,823	33,789	14,593,466	814,991
1941	989,498	401,976,317	34,797	15,965,627	1,024,245
1942	266,276	112,537,426	10,646	5,630,667	276,922
1943	50,358	31,369,198	1,890	1,312,202	52,248
1944	103,847	73,908,549	3,091	2,092,211	106,938
1945	134,408	95,814,102	4,773	3,115,853	139,181
1946	376,502	228,796,110	8,421	5,843,085	384,923
1947	691,087	306,951,814	17,542	9,787,722	708,629
1948	702,293	290,849,177	32,745	18,288,223	735,038
1949	630,808	225,343,624	29,743	14,968,650	660,551
1950	747,109	416,222,598	54,401	41,764,486	801,510
1951	677,874	727,343,348	54,963	80,178,309	732,837
1952	756,987	578,179,519	48,228	40,563,116	805,215
1953	571,635	284,909,223	75,511	46,353,333	647,146
1954	522,364	219,098,143	74,483	42,755,029	596,847
1955	542,507	360,435,303	92,825	80,163,114	635,332
1956	499,479	334,990,045	71,709	61,795,844	564,321
1957	475,958	291,337,628	78,567	58,249,788	554,174
1957:					
Jan.	39,889	24,412,461	6,461	5,203,207	46,350
Feb.	33,145	21,603,218	4,342	3,491,712	37,487
Mar.	34,824	22,769,949	7,336	5,193,356	42,160
Apr.	51,084	31,631,505	8,812	6,608,083	59,896
May	46,772	26,960,166	5,794	4,309,057	52,566
June	25,481	15,262,392	4,810	3,605,798	30,291
July	38,517	23,567,902	6,243	4,721,139	44,760
Aug.	42,117	25,931,151	6,834	4,900,028	48,951
Sept.	38,672	24,073,879	5,516	4,266,918	44,188
Oct.	41,020	25,996,607	8,351	6,120,335	49,020
Nov.	38,087	22,885,060	6,496	4,688,156	44,583
Dec.	46,350	26,243,338	7,572	5,141,999	53,922

Source: Bureau of the Census, U. S. Department of Commerce.

World Production of Natural Rubber

(Including Latex)

(Long Tons)

Year	Malaya	Indonesia	Ceylon	Viet Nam & Cambodia	Latin America*	Rest of World*	Total*
1945	8,600*	10,000*	97,500	12,000*	47,125	73,570	250,000
1946	403,719	175,000*	94,000	19,975	39,678	105,080	837,500
1947	646,362	277,951	89,000	38,128	34,928	172,782	1,260,000
1948	698,189	432,349	95,000	43,935	29,158	225,557	1,525,000
1949	671,503	432,996	89,500	43,010	27,318	225,654	1,490,000
1950	694,090	696,472	113,500	48,482	26,902	280,299	1,860,000
1951	605,346	814,406	105,000	52,136	29,777	278,262	1,885,000
1952	584,238	750,494	96,500	63,134	35,475	261,211	1,790,000
1953	574,390	692,164	98,610	74,545	35,318	250,182	1,725,000
1954	584,435	738,670	93,935	78,024	26,833	280,112	1,802,500
1955	639,128	733,786	93,830	80,172	6,000	344,584	1,897,500
1956	568,550	686,667	95,389	89,072	22,457	336,015	1,857,000
1957	638,706	684,515	98,164	58,440	28,351	381,824	1,890,000
1957:							
July	56,533	86,863	9,551	8,691	2,379	30,483	195,000
Aug.	56,235	74,194	11,040	8,718	1,905	22,908	175,000
Sept.	52,923	59,520	9,234	7,647	2,328	25,848	157,500
Oct.	55,912	55,012	8,898	8,858	2,264	31,556	162,500
Nov.	57,106	46,630	8,941	11,024	2,453	28,846	155,000
Dec.	54,499	53,519	10,223	7,266	500	43,993	170,000

Source: International Rubber Study Group. * Estimated.

World Consumption of Natural and Synthetic Rubber

(Including Latex)

(Long Tons)

Year	United States	United Kingdom	Canada	Europe*	Rest of World*	Total*
1944	710,783	86,977	34,310	132,500	160,690	1,125,000
1945	799,009	91,047	41,836	87,500	108,164	1,127,500
1946	1,039,296	126,770	39,196	145,000	115,804	1,467,500
1947	1,122,327	156,399	61,452	242,500	153,548	1,735,000
1948	1,069,404	196,286	62,121	392,000	182,379	1,902,500
1949	988,903	186,622	56,362	446,500	207,388	1,887,500
1950	1,258,537	222,425	68,695	448,500	287,055	2,285,000
1951	1,214,298	238,101	70,809	476,500	314,941	2,312,500
1952	1,261,413	202,179	67,099	550,000	254,901	2,335,000
1953	1,338,309	211,453	73,394	521,000	343,606	2,500,000
1954	1,233,012	247,612	71,656	544,250	408,094	2,505,000
1955	1,529,699	266,804	84,528	630,000	464,250	2,980,000
1956	1,436,482	232,345	91,458	775,500	489,215	3,025,000
1957	1,469,040	239,021	88,377	766,750	569,412	3,132,500
1957:						
July	108,833	18,246	6,426	63,000	55,995	252,500
Aug.	124,204	12,708	5,252	60,500	49,836	252,500
Sept.	121,326	24,449	7,131	66,500	45,594	265,000
Oct.	137,602	20,783	7,767	61,750	44,598	272,500
Nov.	119,218	20,154	7,573	58,250	52,355	257,500
Dec.	105,922	23,613	6,569	56,500	45,896	237,500

Source: International Rubber Study Group. * Estimated.

Rim Production

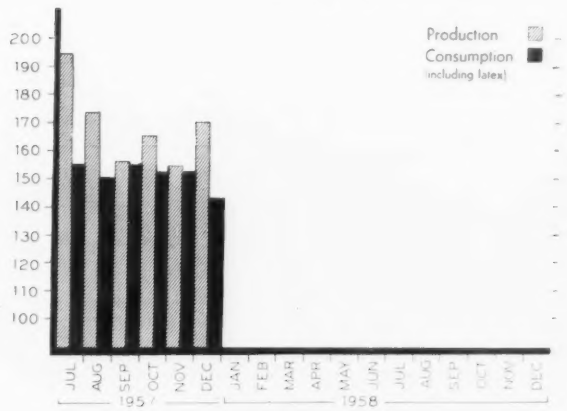
	1953	1954	1955	1956	1957
Passenger Car	31,318,461	25,952,322	38,092,080	27,109,610	27,301,567
Truck & Bus	5,228,831	4,463,689	6,642,329	6,315,428	5,468,223
Agricultural	1,943,489	1,279,040	1,931,768	1,416,938	1,368,127
Earth Mover	24,685	21,536	38,849	88,812	67,289
Total	38,514,954	31,734,587	46,705,036	34,930,788	34,205,206

	1957 Oct.	1957 Nov.	1957 Dec.	1958 Jan.	1958 Feb.	1958 Mar.
Passenger Car	1,929,954	2,333,288	2,210,932	2,330,499	1,578,212	1,599,812
Truck & Bus	322,661	350,177	331,890	333,788	291,400	246,742
Agricultural	90,504	79,302	96,256	101,389	142,643	136,914
Earth Mover	1,890	9,677	2,793	3,827	4,817	3,188
	2,345,009	2,772,384	2,641,871	2,769,503	2,017,072	1,986,657

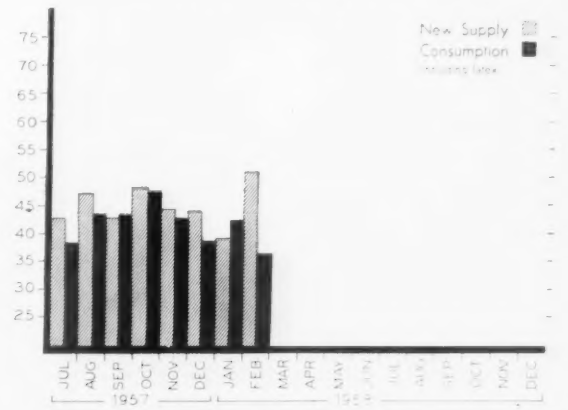
Source: The Tire & Rim Association, Inc.

STATISTICS at a glance

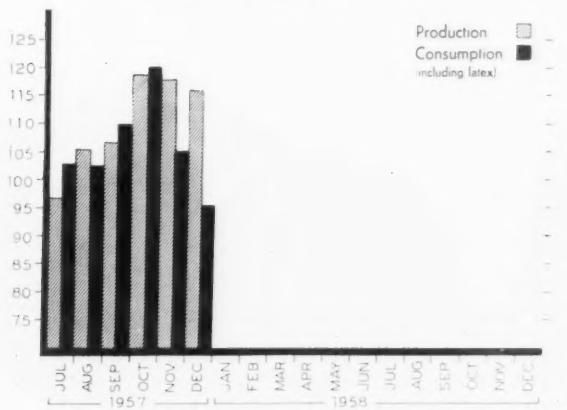
NATURAL RUBBER—WORLD
(thousands of long tons)



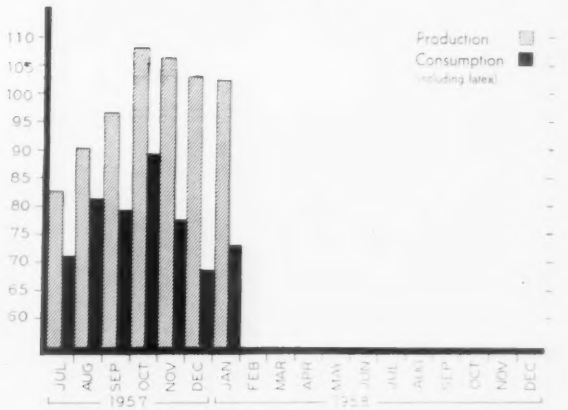
NATURAL RUBBER—UNITED STATES
(thousands of long tons)



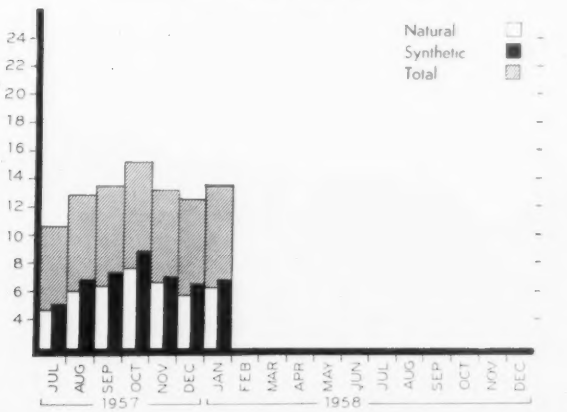
SYNTHETIC RUBBER—WORLD
(thousands of long tons)



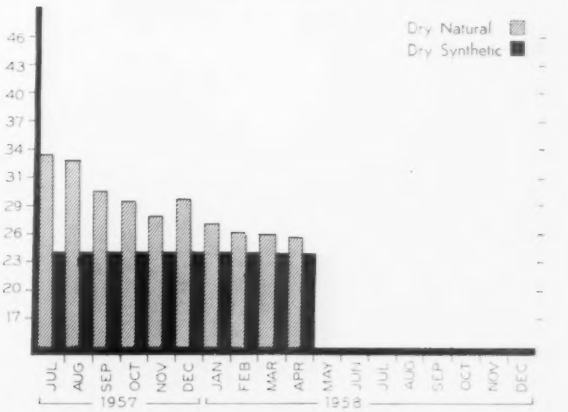
SYNTHETIC RUBBER—UNITED STATES
(thousands of long tons)



LATEX CONSUMPTION—UNITED STATES
(thousands of long tons)



PRICES—NATURAL AND SYNTHETIC
(cents per pound



Synthetic Rubber in the United States

(All Quantities in Long Tons)

New Supply

Year	GR-S	Neoprene	Butyl	N-Type	Total
1949	**310,599**	**35,215**	**54,046**	**11,072**	**410,932**
1950	**378,387**	**50,067**	**60,915**	**12,037**	**501,906**
1951	**704,529**	**58,907**	**76,475**	**15,333**	**855,244**
1952	**654,854**	**65,745**	**81,630**	**16,228**	**818,447**
1953	**680,728**	**80,495**	**79,801**	**20,198**	**861,222**
1954	**490,405**	**69,150**	**58,802**	**21,396**	**639,753**
1955	801,145	91,357	56,179	32,623	982,304
1956	876,982	99,412	75,873	34,547	1,086,814
1957	912,920	110,721	67,418	33,618	1,124,677
1957:					
Apr.	65,706	8,902	5,890	2,449	82,947
May	77,542	9,235	6,145	2,597	95,519
June	68,297	9,678	4,474	2,576	85,025
July	68,295	8,591	2,007	2,617	81,710
Aug.	76,585	9,033	5,475	2,773	93,870
Sept.	76,502	9,726	6,135	2,875	95,238
Oct.	88,400	9,545	6,085	4,002	108,289
Nov.	87,577	9,976	6,099	2,860	106,512
Dec.	85,223	9,568	6,469	2,519	103,779
1958:					
Jan.	85,379	8,804	6,149	2,384	102,716

Consumption

1950	**416,230**	**43,781**	**66,348**	**11,930**	**538,289**
1951	**626,444**	**48,887**	**70,500**	**13,066**	**758,897**
1952	**666,420**	**55,522**	**71,229**	**13,866**	**807,037**
1953	**624,181**	**65,900**	**77,826**	**16,929**	**784,836**
1954	**500,345**	**57,203**	**61,464**	**17,715**	**636,727**
1955	741,997	72,876	53,991	26,035	894,899
1956	727,789	74,887	49,615	24,976	877,267
1957	773,218	75,461	55,413	25,187	929,279
1957:					
May	66,774	6,441	4,902	2,125	80,242
June	58,479	5,816	4,198	1,963	70,456
July	58,021	5,231	4,146	1,646	69,044
Aug.	66,089	6,502	4,461	2,220	79,272
Sept.	64,505	6,351	4,654	2,141	77,651
Oct.	73,850	7,194	5,343	2,433	88,820
Nov.	62,635	6,136	4,521	2,110	75,402
Dec.	56,432	5,464	3,930	1,811	67,637
1958:					
Jan.	60,179	5,928	4,508	2,010	72,625

Exports

1950	**900**	**4,826**	**31**	**1,895**	**7,652**
1951	**483**	**6,825**	**216**	**1,725**	**9,249**
1952	**9,467**	**9,813**	**126**	**2,695**	**22,101**
1953	**7,692**	**11,494**	**237**	**3,245**	**22,668**
1954	**11,069**	**12,062**	**2,831**	**4,155**	**30,117**
1955	60,704	18,098	9,895	4,593	93,290
1956	112,366	21,909	8,699	6,194	149,168
1957	157,977	30,242	8,748	6,377	203,344
1957:					
Mar.	13,664	2,466	1,014	781	17,925
Apr.	10,625	2,244	372	620	13,861
May	12,208	2,480	603	517	15,808
June	13,886	2,315	762	492	17,455
July	14,444	3,426	1,169	631	19,670
Aug.	13,795	2,786	758	478	17,817
Sept.	11,625	1,964	540	396	14,525
Oct.	12,200	2,588	1,261	467	16,516
Nov.	12,639	2,521	809	410	16,379
Dec.	15,549	2,447	814	563	19,373

Stocks

1949	**77,731**	**4,654**	**12,224**	**3,433**	**98,042**
1950	**36,942**	**5,733**	**7,243**	**2,840**	**52,758**
1951	**105,271**	**8,379**	**12,481**	**3,821**	**129,912**
1952	**83,861**	**8,535**	**22,716**	**3,875**	**118,987**
1953	**135,153**	**11,480**	**24,866**	**4,346**	**175,845**
1954	**115,499**	**11,349**	**19,267**	**4,280**	**150,395**
1955	108,989	12,220	10,500	6,030	137,739
1956	151,763	14,077	28,744	7,934	202,518
1957	141,199	18,843	31,489	7,454	198,985
1957:					
May	121,638	13,010	31,812	6,981	173,441
June	120,694	13,822	31,569	7,085	173,230
July	113,143	15,172	28,208	7,125	163,648
Aug.	111,962	14,603	28,339	6,784	161,688
Sept.	109,417	14,751	29,132	7,207	160,507
Oct.	113,382	15,181	29,008	7,134	164,705
Nov.	124,432	16,453	29,702	7,380	177,967
Dec.	141,199	18,843	31,489	7,454	198,985
1958:					
Jan.	152,441	18,691	31,753	7,512	210,397

Source: U. S. Department of Commerce.

Natural and Synthetic Rubber Latex in the United States

(All Quantities in Long Tons)

New Supply

Year	Natural	GR-S	Neoprene	N-Type	Total Synthetic	Grand Total
1945	**4,768**	**15,176**	**7,077**	**.....**	**22,253**	**27,021**
1946	**8,012**	**24,810**	**13,595**	**.....**	**38,405**	**46,417**
1947	**17,675**	**22,474**	**6,089**	**.....**	**28,563**	**46,238**
1948	**32,630**	**21,494**	**5,022**	**.....**	**26,516**	**59,146**
1949	**29,974**	**21,357**	**3,651**	**.....**	**25,008**	**54,982**
1950	**54,401**	**31,339**	**5,725**	**.....**	**37,064**	**91,465**
1951	**54,963**	**32,972**	**6,866**	**2,948**	**42,786**	**97,749**
1952	**48,228**	**42,273**	**7,598**	**4,164**	**54,035**	**102,263**
1953	**75,511**	**48,112**	**9,026**	**5,844**	**62,982**	**138,493**
1954	**74,483**	**48,379**	**8,214**	**6,866**	**63,459**	**137,942**
1955	92,754	69,364	10,432	10,798	90,594	183,348
1956	72,013	69,720	10,642	10,650	91,012	163,025
1957	69,513	74,535	10,403	11,420	96,358	165,871
1957:						
Jan.	6,460	7,270	905	960	9,135	15,595
Feb.	4,342	6,491	724	1,035	8,250	12,592
Mar.	5,856	7,268	924	1,127	9,319	15,175
Apr.	8,812	6,348	976	881	8,205	17,017
May	5,794	5,495	1,082	933	7,510	13,304
June	4,809	5,241	819	886	6,946	11,755
July	6,243	4,646	572	844	6,062	12,305
Aug.	6,834	6,816	874	608	8,298	15,132
Sept.	5,516	5,649	917	1,285	7,851	13,367
Oct.	8,351	6,876	885	1,133	8,894	17,245
Nov.	6,496	6,515	1,021	994	8,530	15,026
Dec.	4,833	5,915	704	734	7,353	12,186
1958:						
Jan.	4,940	5,998	788	785	7,571	12,511

Consumption[1]

1945	**3,886**	**14,500**	**6,800**	**....**	**21,300**	**25,186**
1946	**5,714**	**23,500**	**13,000**	**....**	**36,500**	**42,214**
1947	**13,909**	**22,500**	**6,500**	**....**	**29,000**	**42,909**
1948	**28,489**	**21,500**	**5,250**	**....**	**26,750**	**55,239**
1949	**36,117**	**21,500**	**3,750**	**....**	**25,250**	**61,367**
1950	**56,138**	**31,000**	**5,500**	**....**	**36,500**	**92,638**
1951	**46,750**	**31,031**	**6,279**	**2,628**	**39,938**	**86,688**
1952	**53,567**	**40,562**	**7,368**	**3,093**	**51,023**	**104,590**
1953	**67,375**	**46,473**	**7,981**	**3,654**	**58,108**	**125,483**
1954	**75,931**	**44,173**	**7,251**	**4,507**	**55,931**	**131,862**
1955	86,478	63,982	8,736	8,495	81,213	167,691
1956	74,082	62,762	8,708	8,021	79,491	153,573
1957	76,509	67,305	9,039	8,630	84,974	161,483
1957:						
Jan.	6,994	6,288	856	841	7,985	14,979
Feb.	6,398	5,894	758	708	7,360	13,758
Mar.	7,081	6,370	784	799	7,953	15,034
Apr.	6,434	5,554	772	710	7,036	13,470
May	5,867	5,114	814	731	6,659	12,526
June	5,445	4,790	736	610	6,136	11,581
July	5,180	4,269	677	480	5,426	10,606
Aug.	6,499	5,758	784	823	7,365	13,864
Sept.	6,645	5,676	712	753	7,141	13,786
Oct.	7,250	6,556	788	857	8,201	15,451
Nov.	6,783	5,776	725	712	7,213	13,996
Dec.	5,933	5,260	651	606	6,517	12,450
1958:						
Jan.	6,380	5,438	806	683	6,927	13,307

Stocks at End of Period

1945	3,121	....	....	....	....	3,121
1946	4,865	....	....	....	....	4,865
1947	5,033	....	....	....	....	5,033
1948	11,235	....	....	....	....	11,235
1949	5,063	....	....	....	....	5,063
1950	4,927	....	....	....	....	4,927
1951	4,752	3,727	1,245	532	5,504	10,256
1952	6,201	5,040	1,019	902	6,961	13,162
1953	13,532	4,794	1,117	721	6,632	20,164
1954	11,133	5,134	1,087	811	7,032	18,165
1955	13,203	6,980	1,236	1,807	10,203	23,406
1956	12,064	7,451	1,384	1,558	10,393	22,457
1957	14,454	8,347	1,267	1,974	11,588	26,042
1957:						
Jan.	11,831	7,191	1,329	1,936	10,456	22,287
Feb.	9,940	7,415	1,169	2,051	10,635	20,575
Mar.	10,173	7,689	1,170	2,157	11,016	21,189
Apr.	12,064	8,096	1,183	1,836	11,115	23,179
May	11,733	7,885	1,407	1,710	11,002	22,735
June	10,931	8,139	1,377	2,001	11,517	22,448
July	12,073	8,045	1,296	1,953	11,294	23,367
Aug.	13,535	7,997	1,309	1,545	10,851	24,386
Sept.	12,315	7,566	1,141	1,700	10,407	22,722
Oct.	12,399	7,254	1,142	1,723	10,119	22,518
Nov.	12,316	7,558	1,265	1,927	10,750	23,066
Dec.	14,454	8,662	1,267	1,974	11,903	26,357
1958:						
Jan.	14,178	8,222	1,190	2,052	11,464	25,642

Source: U. S. Department of Commerce.
Note: (1) GR-S and Neoprene consumption estimated through 1950.

ROLL CAMBER ADJUSTED BY FABRIC EDGE GAGE
FOR PRECISE CONTROL OF WIDTH, CENTERING AND EDGE
CONDITION OF TIRE FABRICS AND OTHER OPEN WEAVES
DURING WEB PROCESSING . . . *Bulletin on Request*

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For
RESEARCH and
MANUFACTURING
DEPENDABILITY

THE STAMFORD RUBBER SUPPLY COMPANY, STAMFORD, CONN.

Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1951 (total)	32,153	44,612	1,677	78,442	83,405	8,765
Passenger Car	26,729	34,226	723	61,678	65,546	6,973
Truck and Bus	5,424	10,386	954	16,764	17,859	1,791
1952 (total) ..	29,484	54,342	1,520	85,346	90,411	14,110
Passenger Car.	24,106	45,458	741	70,305	74,341	11,251
Truck and Bus	5,378	8,884	779	15,041	16,070	2,859
1953 (total)	37,949	55,124	1,543	94,617	96,150	15,720
Passenger Car.	33,106	45,798	809	79,713	81,455	13,044
Truck and Bus	4,843	9,326	734	14,904	14,696	2,676
1954 (total)	33,333	55,155	1,753	90,241	89,141	14,762
Passenger Car.	29,741	47,044	928	77,713	76,794	12,217
Truck and Bus	3,591	8,111	826	12,528	12,347	2,545
1955 (total)	47,374	59,246	1,879	108,499	112,178	18,778
Passenger Car.	42,574	50,189	966	93,730	97,223	15,963
Truck and Bus	4,800	9,057	912	14,769	14,955	2,815
1956 (total)	35,422	62,146	1,757	99,325	100,406	79,872
Passenger Car.	30,873	53,252	875	85,000	85,546	16,494
Truck and Bus	4,548	8,894	883	14,325	14,859	3,378
1957 (total) ...	36,765	65,150	1,733	103,649	106,940	250,536
Passenger Car.	32,725	56,603	889	90,217	93,542	210,146
Truck and Bus	4,053	8,546	846	13,432	13,398	40,384
1957:						
Feb. (total)	3,361	5,051	127	8,539	9,169	21,008
Passenger Car.	3,017	4,453	68	7,538	8,047	17,376
Truck and Bus	344	598	59	1,001	1,122	3,633
Mar. (total)	3,381	5,579	154	9,114	9,766	21,743
Passenger Car	3,051	4,875	80	8,007	8,630	18,068
Truck and Bus	340	704	74	1,107	1,136	3,675
Apr. (total) ...	3,246	5,989	146	9,381	8,950	21,308
Passenger Car.	2,809	5,218	78	8,104	7,878	17,821
Truck and Bus	438	770	69	1,277	1,072	3,486
May (total) ...	3,230	5,786	134	9,151	9,490	21,630
Passenger Car.	2,831	5,166	60	8,057	8,312	18,050
Truck and Bus	399	620	74	1,094	1,178	3,580
June (total) ...	2,993	6,191	127	9,310	8,489	20,783
Passenger Car.	2,623	5,476	63	8,162	7,462	17,322
Truck and Bus	370	715	64	1,148	1,027	3,461
July (total) ..	3,068	6,646	126	9,840	8,443	19,316
Passenger Car.	2,719	5,826	65	8,611	7,449	16,097
Truck and Bus	349	819	61	1,229	994	3,219
Aug. (total)	3,214	6,488	130	9,833	8,917	18,477
Passenger Car	2,886	5,675	66	8,627	7,801	15,348
Truck and Bus	328	813	65	1,206	1,117	3,129
Sept. (total)	1,688	5,902	133	7,723	8,641	19,393
Passenger Car.	1,398	5,096	70	6,564	7,535	16,310
Truck and Bus	290	805	63	1,159	1,105	3,083
Oct. (total)	2,620	5,351	182	8,154	9,708	20,985
Passenger Car	2,298	4,392	88	6,778	8,437	17,998
Truck and Bus	322	960	94	1,375	1,271	2,987
Nov. (total)	3,308	3,630	143	7,171	8,248	22,178
Passenger Car.	3,098	3,049	74	6,220	7,098	18,960
Truck and Bus	301	581	70	951	1,150	3,211
Dec. (total)	3,070	3,342	148	6,559	7,615	23,225
Passenger Car.	2,803	2,858	78	5,739	6,597	19,818
Truck and Bus	267	484	70	820	1,018	3,408
1958:						
Jan. (total)	2,653	5,311	107	8,271	7,814	22,769
Passenger Car.	2,377	4,838	50	7,264	6,740	19,299
Truck and Bus	277	674	57	1,007	1,074	3,470
Feb. (total)	2,253	4,374	110	6,737	7,314	23,392
Passenger Car.	1,998	3,777	57	5,833	6,320	19,820
Truck and Bus	254	598	52	904	994	3,572

Source: The Rubber Manufacturers Association, Inc.

Automobile Production in U. S.

(Civilian Production Only)

Year	Passenger Cars	Trucks	Total	Year	Passenger Cars	Trucks	Total
1938	2,000,985	485,852	2,486,837	1948	3,909,270	1,363,856	5,273,126
1939	2,866,796	704,308	3,571,104	1949	5,108,841	1,123,736	6,232,577
1940	3,692,328	721,637	4,413,965	1950	6,665,836	1,332,263	7,998,099
1941	3,744,500	875,381	4,619,681	1951	5,337,729	1,420,432	6,758,161
1942	220,814	133,083	353,897	1952	4,320,794	1,212,790	5,533,584
1943	0	4,501	4,501	1953	6,121,787	1,202,196	7,323,983
1944	0	124,819	124,819	1954	5,558,897	1,038,045	6,596,942
1945	83,792	313,643	397,435	1955	7,920,186	1,245,018	9,165,204
1946	2,148,699	930,760	3,079,429	1956	5,816,109	1,100,417	6,916,526
1947	3,558,178	1,220,634	4,778,812	1957	6,113,344	1,097,006	7,210,350
1957:							
Jan.	628,045	91,117	719,162	July	484,718	96,048	580,766
Feb.	570,023	91,767	661,790	Aug.	521,282	90,152	611,434
Mar.	585,734	91,703	676,437	Sept.	318,279	63,131	381,410
Apr.	541,733	105,175	646,908	Oct.	291,064	88,879	379,943
May	537,112	102,312	639,424	Nov.	583,783	94,574	678,357
June	496,329	94,321	590,650	Dec.	555,242	87,327	642,569
1958:							
Jan.	478,416	79,777	558,193	July	.....	.....	.....
Feb.	396,221	71,056	467,277	Aug.	.....	.....	.....
Mar.	.....	.....	.....	Sept.	.....	.....	.....
Apr.	.....	.....	.....	Oct.	.....	.....	.....
May	.....	.....	.....	Nov.	.....	.....	.....
June	.....	.....	.....	Dec.	.....	.....	.....

Source: Automobile Manufacturers Association.
Note: Figures are based on factory sales. Revisions are made from time to time in these figures and the latest issue should be consulted for accuracy.

Automotive Inner Tubes

(Thousands of Units)

	Shipments					
Year	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1946	15,327	59,357	1,424	76,108	77,251	3,820
1947	25,046	46,560	2,483	74,088	79,181	8,059
1948	26,833	40,548	1,119	68,499	70,033	9,641
1949	31,521	31,450	887	63,858	65,114	10,657
1950	41,240	42,671	811	84,723	80,179	..
1951	32,151	32,284	1,071	65,507	67,249	10,094
1952	29,451	32,985	1,014	53,449	65,073	12,036
1953	37,957	36,072	878	74,907	74,425	11,874
1954	25,071	35,576	945	61,593	48,279	9,519
1955	5,001	33,387	1,001	39,389	35,900	6,833
1956	3,100	32,358	1,040	36,498	34,405	6,109
1957	3,046	35,687	1,076	39,806	39,774	80,077
1957:						
May	301	2,829	84	3,214	3,548	7,422
June	275	3,128	69	3,472	3,025	6,946
July	258	3,364	86	3,708	2,941	6,287
Aug.	243	3,358	82	3,683	3,134	5,966
Sept.	213	3,180	90	3,483	3,365	6,174
Oct.	242	2,809	121	3,172	3,764	6,909
Nov.	237	2,403	96	2,736	3,243	7,444
Dec.	225	2,392	101	2,717	2,778	7,671
1958:						
Jan.	232	4,005	72	4,309	3,344	6,700
Feb.	209	3,130	73	3,412	3,444	6,866

Source: The Rubber Manufacturers Association, Inc.

Vinyl and Vinyl Copolymer Resins—Sales

(Thousands of Pounds—Resin Content)

	Polyvinyl Chloride and Copolymer Resins							All Other Vinyl Resins		
	Film	Sheeting	Molding & Extrusion	Textile & Paper Treating	Flooring	Protective Coatings	All Other Uses	Adhesives	All Other Uses	Grand Total
1953	63,691	62,385	129,215	52,353	22,152	22,823	27,790	22,411	77,478	480,299
1954	69,943	56,588	147,284	49,546	34,890	23,676	35,148	26,609	74,090	517,773
1955	83,276	51,424	183,736	64,223	56,357	27,439	53,868	31,853	105,644	657,821
1956	78,063	55,598	206,726	62,931	65,384	28,522	71,859	36,565	115,151	720,799
1957	90,543	56,344	216,517	66,392	81,357	31,519	50,637	41,665	113,396	748,370
1957:										
Jan.	8,094	5,761	18,505	6,197	5,958	3,077	3,438	2,988	10,408	64,426
Feb.	8,669	4,564	19,805	5,137	6,221	2,682	3,258	3,255	9,529	63,120
Mar.	8,589	5,272	20,792	5,440	6,879	2,798	4,173	3,372	10,060	67,375
Apr.	7,036	4,191	18,393	4,616	7,890	3,495	4,254	4,211	8,975	63,061
May	7,641	3,765	18,218	4,628	7,519	3,227	4,388	3,404	10,371	63,161
June	7,098	3,861	17,195	4,688	6,245	2,362	3,791	4,467	9,851	59,558
July	6,342	4,362	14,340	5,371	6,030	2,755	2,872	3,236	7,976	53,284
Aug.	7,121	4,941	17,962	6,884	7,553	2,515	4,252	3,677	9,011	63,916
Sept.	9,406	4,987	18,653	6,542	7,156	2,363	4,189	3,191	8,771	65,258
Oct.	10,747	5,102	21,712	6,802	7,506	2,256	4,466	3,771	10,887	73,249
Nov.	5,569	5,142	16,940	6,151	6,224	1,916	6,211	3,197	9,265	60,615
Dec.	4,231	4,396	14,002	3,936	6,176	2,073	5,345	2,896	8,292	51,347
1958:										
Jan.	5,870	4,119	16,361	4,035	7,562	2,885	4,071	3,213	10,780	58,896
Feb.	5,902	4,412	13,907	4,468	7,964	2,250	3,369	3,484	9,193	54,949

Source: Chemical Division, U. S. Tariff Commission.

Shredding Rubber Slabs

SPEEDS CHURNING OF RUBBER CEMENT BY 25%

saves solvents...enhances quality

A manufacturer of rubber latex compounds formerly used the conventional manual method of cutting rubber prior to dissolving it.

Manual cutting was slow. Large particles of rubber would remain in suspension after churning. These particles would be filtered out in processing thus causing different batches of cement to vary in strength.

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Hyde Park 2430-0456	SHerwood 2-8262	BLackstone 3-9222	TOpaz 1-0371	(56) 2130-2149

Rubber Industry Employment Earnings and Hours

All Rubber Products

Mo.	1956 Production Workers (thousands)	1956 Average Weekly Earnings	1956 Average Weekly Hours	1956 Average Hourly Earnings	1957 Production Workers (thousands)	1957 Average Weekly Earnings	1957 Average Weekly Hours	1957 Average Hourly Earnings
Jan.	229.5	$87.91	40.7	$2.16	216.0	91.21	40.9	2.23
Feb.	224.5	85.81	40.1	2.14	212.6	90.80	40.9	2.22
Mar.	220.8	84.93	39.5	2.15	211.4	89.28	40.4	2.21
Apr.	218.7	85.79	39.9	2.15	191.3	87.60	40.0	2.19
May	216.0	86.18	39.9	2.16	204.2	88.80	40.0	2.22
June	208.5	84.93	39.5	2.15	196.8	91.21	40.9	2.23
July	208.0	86.15	39.7	2.17	199.8	94.16	41.3	2.28
Aug.	210.8	87.64	40.2	2.18	204.3	92.84	40.9	2.27
Sept.	215.4	89.51	40.5	2.21	206.4	92.97	40.6	2.29
Oct.	220.0	90.17	40.8	2.21	209.5	93.03	40.1	2.32
Nov.	198.9	88.29	40.5	2.18	209.0	93.20	40.0	2.33
Dec.	221.5	93.15	41.1	2.25	207.4	92.40	40.0	2.31

Tires and Tubes

Jan.	93.7	101.00	40.4	2.50	87.4	107.64	41.4	2.60
Feb.	93.2	97.71	39.4	2.48	86.8	106.19	41.0	2.59
Mar.	92.6	97.25	38.9	2.50	86.9	102.40	40.0	2.56
Apr.	91.8	98.00	39.2	2.50	71.1	103.46	40.1	2.58
May	91.6	99.65	39.7	2.51	84.9	103.46	40.1	2.58
June	90.1	98.25	39.3	2.50	78.2	107.23	41.4	2.59
July	90.0	98.14	39.1	2.51	83.9	112.20	42.5	2.64
Aug.	89.8	101.20	40.0	2.53	84.2	107.83	41.0	2.63
Sept.	91.6	102.51	40.2	2.55	84.4	107.20	40.3	2.66
Oct.	91.7	102.66	40.1	2.56	84.4	105.18	39.1	2.69
Nov.	74.8	103.53	40.6	2.55	84.0	106.62	39.2	2.72
Dec.	93.2	109.25	41.7	2.62	83.7	105.84	39.2	2.70

Rubber Footwear

Jan.	21.0	74.37	40.2	1.85	18.3	71.76	39.0	1.84
Feb.	20.9	74.74	40.4	1.85	17.8	72.10	39.4	1.83
Mar.	20.7	71.34	39.2	1.82	17.8	72.68	39.5	1.84
Apr.	20.3	72.25	39.7	1.82	17.5	70.64	38.6	1.83
May	20.0	72.25	39.7	1.82	17.3	71.92	39.3	1.83
June	19.4	70.53	39.4	1.79	17.4	72.29	39.5	1.83
July	18.9	71.28	39.6	1.80	16.8	72.13	39.2	1.84
Aug.	19.2	70.35	39.3	1.79	17.2	73.05	39.7	1.84
Sept.	19.3	71.71	39.4	1.82	17.6	74.45	39.6	1.88
Oct.	91.1	71.71	39.4	1.82	17.7	76.02	39.8	1.91
Nov.	18.7	71.55	39.1	1.83	18.0	78.96	40.7	1.94
Dec.	18.4	73.26	39.6	1.85	17.9	79.35	40.9	1.94

All Other Rubber Products

Jan.	114.8	79.73	41.1	1.94	110.3	81.39	40.9	1.99
Feb.	110.4	77.95	40.6	1.92	108.0	81.18	41.0	1.98
Mar.	107.5	76.99	40.1	1.92	106.7	81.19	40.8	1.99
Apr.	106.6	77.95	40.6	1.92	102.7	79.60	40.2	1.98
May	104.4	76.99	40.1	1.92	102.0	79.80	40.1	1.99
June	99.0	76.02	39.8	1.91	101.2	81.81	40.7	2.01
July	99.1	77.78	40.3	1.93	99.1	82.62	40.7	2.03
Aug.	101.8	78.76	40.6	1.94	102.9	83.84	41.1	2.04
Sept.	104.5	81.18	41.0	1.98	104.4	85.08	41.1	2.07
Oct.	109.2	82.98	41.7	1.99	107.4	86.10	41.0	2.10
Nov.	105.4	79.98	40.6	1.97	107.0	85.05	40.5	2.10
Dec.	109.9	82.59	41.5	1.99	105.8	84.03	40.4	2.08

Source: U. S. Department of Labor.

Note: Data are based upon reports from cooperating establishments covering both full and part-time employees who work during, or received pay for, any part of the pay period ending nearest the 15th of the month. These employment series have been adjusted to first quarter 1954 benchmark levels indicated by data from government social insurance programs. Hours and earnings data pertain only to production and related workers.

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market—in Cents)

Average Monthly Price Per Pound

	1951	1952	1953	1954	1955	1956	1957	1958
Jan.	45.04	42.96	33.24	34.15	35.07	35.24	34.82	36.31
Feb.	(a)	41.64	33.76	35.00	35.04	36.26	34.82	35.83
Mar.	46.06	41.70	34.10	35.23	34.33	36.70	35.35	36.05
Apr.	46.60	41.79	33.85	35.22	34.23	36.81	35.43	36.00
May	46.06	39.98	34.30	35.34	34.80	36.65	35.40	....
June	46.06	41.31	34.11	35.17	34.83	36.67	35.45	....
July	46.21	40.37	34.20	35.37	34.61	35.43	35.49	....
Aug.	35.93	40.42	33.82	35.19	34.53	34.31	35.15	....
Sept.	36.20	39.75	33.69	35.46	33.85	34.35	34.74	....
Oct.	38.13	37.52	33.53	35.24	33.93	34.45	35.09	....
Nov.	42.70	35.59	33.60	34.80	34.87	34.56	36.06	....
Dec.	43.32	33.76	33.52	35.03	34.95	34.56	36.50	....
Average for Year	42.43	39.71	33.81	35.10	34.59	35.50	35.36	....

Note: The Government established a ceiling of 45.76c for spot cotton on March 3, 1951. (a) Trading suspended during February.

Production Index for the Rubber Industry

(1947-1949 = 100)

(Based on man-hours)

	1956	1957	1958		1956	1957	1958
Jan.	147	145	116	July	125	136	...
Feb.	140	141	114	Aug.	135	141	...
Mar.	135	145	...	Sept.	132	138	...
Apr.	136	132	...	Oct.	134	135	...
May	127	134	...	Nov.	126	131	...
June	120	135	...	Dec.	137	117	...

Sales by the Rubber Industry

(in Millions of Dollars*)

	1956	1957	1958		1956	1957	1958
Jan.	415	496	448	July	459	514	...
Feb.	445	495	...	Aug.	436	514	...
Mar.	451	476	...	Sept.	429	481	...
Apr.	445	490	...	Oct.	454	490	...
May	464	481	...	Nov.	463	431	...
June	450	458	...	Dec.	461	427	...

Rubber Manufacturers' Inventories

(in Millions of Dollars*)

	1956	1957	1958		1956	1957	1958
Jan.	935	1,047	1,110	July	987	1,045	...
Feb.	970	1,036	...	Aug.	1,007	1,074	...
Mar.	979	1,030	...	Sept.	1,007	1,074	...
Apr.	970	1,031	...	Oct.	1,002	1,097	...
May	985	1,024	...	Nov.	1,024	1,101	...
June	975	1,027	...	Dec.	998	1,092	...

Source: U. S. Department of Commerce.
Notes: * Adjusted for seasonal variation.

No. 1 R.S.S.—Annual Average Prices

(New York Market—Cents per Pound)

Year	High	Low	Avg.	Year	High	Low	Avg.
1916	102	55	72.50	1937	26⅞	14	19.39
1917	90	52	72.23	1938	17 11/16	10¼	14.64
1918	70	40	60.15	1939	24	14⅛	17.57
1919	57	38½	48.70	1940	24	18¼	20.10
1920	56½	16	36.30	1941	24⅞	19⅛	22.40
1921	21¼	11½	16.36	1942	22½	22½	22.50
1922	28⅜	13⅝	17.50	1943	22½	22½	22.50
1923	37⅛	24¾	29.45	1944	22½	22½	22.50
1924	40⅛	17⅝	26.20	1945	22½	22½	22.50
1925	121	34⅜	72.46	1946	22½	22½	22.50
1926	88½	36¾	48.50	1947	25	14	20.00
1927	41¾	33	37.72	1948	25	18	21.99
1928	41¾	17	22.48	1949	19¾	15⅞	17.57
1929	26⅞	15½	20.55	1950	86	18	41.10
1930	16⅛	7½	11.98	1951	76	52	(a)
1931	8⅜	4¼	6.17	1952*	33	26½	29.15
1932	4¼	2½	3.49	1953	31⅞	19⅞	24.21
1933	9⅞	2⅞	5.96	1954	34½	19½	23.61
1934	15⅞	8¾	12.92	1955	52	29⅜	39.16
1935	13¾	10½	12.37	1956	45	26½	34.24
1936	23	13½	16.41	1957	37⅜	26⅝	31.13

Note: Price was fixed by Government on August 6, 1941, at 22½c a pound for non-war uses. Free trading was resumed May 1, 1947. (a) Free trading suspended March 31, 1951. GSA selling price ranged between 52 and 66c during balance of year. * Free trading was resumed on July 1, 1952; figures represent only July through December, 1952.

No. 1 R.S.S.—Monthly Average Prices

(New York Market—Cents per pound)

	1951	1952	1953	1954	1955	1956	1957	1958
Jan.	71.21	....	29.40	20.22	33.92	41.70	33.32	27.15
Feb.	73.61	....	27.57	19.98	34.90	33.68	30.43	26.32
Mar.	72.05	....	26.59	20.16	31.08	33.68	31.76	26.64
Apr.	....	....	24.66	22.06	31.75	31.74	32.23	26.44
May	....	....	25.52	21.96	31.35	29.61	32.12	....
June	....	....	24.42	23.01	34.74	30.54	32.80	....
July	....	30.52	23.64	24.12	40.84	33.91	32.88	....
Aug.	....	29.36	23.36	23.26	45.85	35.69	32.13	....
Sept.	....	27.42	23.06	23.99	48.27	32.64	29.94	....
Oct.	....	27.26	20.82	26.57	43.81	32.68	29.24	....
Nov.	....	29.25	20.58	28.07	44.95	35.18	27.47	....
Dec.	....	31.26	20.92	29.88	48.40	37.01	29.25	....
Average for Year	(*)	29.15	24.21	23.61	39.16	34.24	31.13	....

Note: (*) Free trading suspended March 31, 1951, and resumed on July 1, 1952.

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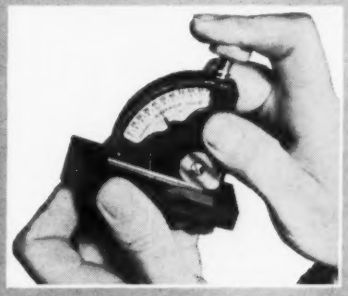

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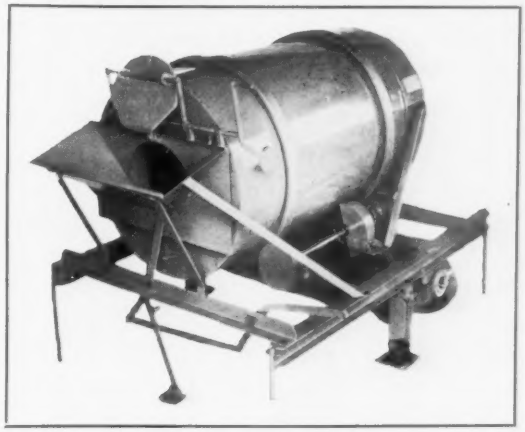

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TIRES POLYETHYLENE BUFFINGS

Various Compounding Materials Consumed by the Rubber Industry

Material	1950	1951	1952	1953	1954	1955	1956
Antimony, Primary:							
Short tons	165[c]	19[c]	66[c]	20[c]	49[c]	78	56
% of total	.007	.001	.004	.001	.004	.006	.013
Asphalt:[a]							
Short tons	26,815	21,414	33,288	.....	.....	.....	.....
% of total	0.3	0.3	0.4	.....	.....	.....	.....
Barite (Barytes):							
Short tons	19,000	15,000	18,000	21,000	20,000	25,104	22,101
% of total	1.31	2.13	2.0	2.0	2.0	2.0	2.0
Carbon Black:							
Short tons	515,184	530,614	537,273	566,797	511,813	643,430	622,325
% of total	92.9	93.9	93.1	94.4	93.5	93.5	95.5
Clay, Kaolin:							
Short tons	262,306	231,321	240,982	241,052	247,431	257,223	268,157
% of total	15.0	12.7	13.2	12.8	13.2	11.9	12.0
Clay, Fire & Stoneware:							
Short tons	9,500	.....	9,322	18,475	8,781	2,928	.....
% of total	0.1	.....	0.1	.2	.1	.2	.....
Lime:							
Short tons	808	1,126	2,000	1,631	1,555	1,465	2,487
% of total	.0002	(d)	(d)	(d)	(d)	(d)	(d)
Litharge:							
Short tons	3,047	2,641	2,109	2,230	1,768	1,947	2,266
% of total	1.7	1.3	1.5	1.4	1.3	1.3	1.7
Lithopone:							
Short tons	4,092	3,295	1,523	1,723	1,701	2,163	2,000[e]
% of total	5.9	5.2	2.5	3.3	3.9	5.0	5.0
Mica, Ground:							
Short tons	5,576	6,551	5,126	5,668	5,021	7,339	7,021
% of total	8.0	9.0	7.0	7.8	6.3	6.9	8.0
Sulfur:							
Short tons	75,000	84,000	84,000	89,600	84,000	89,600	89,600
% of total	1.3	1.4	1.4	1.4	1.3	1.2	1.1
Talc:[b]							
Short tons	75,500	70,970	64,476	61,408	58,139	38,309	30,253
% of total	12.0	11.2	10.9	10.0	9.7	5.4	5.0
Zinc Oxide:							
Short tons	82,944	71,507	72,774	78,439	71,058	86,677	90,000[e]
% of total	51.6	48.4	51.2	52.7	50.7	51.5	52.0

Source: U. S. Bureau of Mines.
Notes: (a) Solid and semi-solid products of less than 200 penetration. (b) Includes prophyllite and ground soapstone. (c) Does not include precipitated antimony sulfide as in previous years. (d) Negligible. (e) Estimated.

Reclaimed Rubber

(Including Natural and Synthetic)

(All Quantities in Long Tons)

Year	New Supply	Consumption: Tons	Consumption: % to Crude[a]	Exports	Stocks On Hand at End of Period
1941	**274,202**	**251,231**	**32.2**	**13,851**	**41,750**
1942	**286,00/[b]**	**254,820**	**64.6**	**30,405**	**42,532**
1943	**304,058[c]**	**291,082**	**59.6**	**15,678**	**46,201**
1944	**260,631[d]**	**251,083**	**35.3**	**11,800**	**43,832**
1945	**243,309**	**241,036**	**30.2**	**13,413**	**28,155**
1946	**295,612**	**275,410**	**26.5**	**14,461**	**33,666**
1947	**291,395**	**288,395**	**24.8**	**14,556**	**35,943**
1948	**266,861**	**261,113**	**24.4**	**11,428**	**32,630**
1949	**224,029**	**226,679**	**22.5**	**10,637**	**28,263**
1950	**314,008**	**303,733**	**24.1**	**11,740**	**35,708**
1951	**366,700**	**346,121**	**26.6**	**14,722**	**45,082**
1952	**274,981**	**280,002**	**22.2**	**11,180**	**30,664**
1953	**298,336**	**285,050**	**21.3**	**11,597**	**32,319**
1954	**258,101**	**249,049**	**20.2**	**10,232**	**30,746**
1955	**326,649**	**312,781**	**20.4**	**13,988**	**31,498**
1956	**287,220**	**270,547**	**18.8**	**13,832**	**34,969**
1957	271,647	267,352	18.2	13,021	29,323
1957:					
Feb.	21,896	22,773	18.4	1,263	32,010
Mar.	25,088	24,633	19.0	1,298	30,975
Apr.	22,878	23,145	19.0	1,201	30,258
May	24,884	23,816	18.8	1,277	29,847
June	22,402	21,352	19.1	1,083	30,379
July	20,469	19,676	18.1	757	29,972
Aug.	20,432	22,429	18.1	917	28,521
Sept.	19,892	21,704	17.9	714	25,983
Oct.	26,419	24,925	18.1	1,230	27,171
Nov.	22,083	20,583	17.3	1,150	27,855
Dec.	20,101	18,263	17.2	843	29,323
1958:					
Jan.	21,159	21,186	18.4	....	29,569

Source: U. S. Bureau of Mines.
Notes: (a) Solid and semi-solid products of less than 200 penetration. (b) Includes prophyllite and ground soapstone. (c) Does not include precipitated antimony sulfide as in previous years. (d) Negligible. (e) Estimated.

Cotton, Rayon and Nylon Tire Fabrics

(In Thousands of Pounds)

	Production: Rayon Tire Cord Not Woven	Production: Rayon Tire Cord Woven	Production: Cotton and Nylon Cord & Fabric[a]	Production: Chafer Fabrics (all fibers)	Production: Total Tire Cord and Fabric	Stocks[b]: Cotton and Nylon Cord & Fabric	Stocks[b]: Rayon Cord and Fabric
1956:							
Jan.-Mar.	23,707	74,833	29,298	14,176	129,199	10,185	48,936
Apr.-June	21,557	60,644	28,752	11,628	112,546	10,433	43,737
July-Sept.	18,698	56,961	26,349	7,958	102,575	11,094	44,376
Oct.Dec.	20,071	55,655	28,493	9,497	104,921	12,500	38,060
Total	84,033	248,093	112,892	43,259	449,241	44,212	175,109
1957:							
Jan.-Mar.	21,853	68,825	31,393	11,028	123,182	11,844	37,153
Apr.-June	16,037	63,195	35,308	10,456	115,418	13,428	13,473
July-Sept.	10,509	54,968	33,477	9,147	100,091	13,305	36,388
Oct.-Dec.	9,216	58,392	32,827	10,176	101,687	14,909	29,632
Total	57,615	245,380	133,005	40,807	440,378	53,486	116,646

Source: Bureau of the Census, U. S. Department of Commerce.
Notes: (a) Combined to avoid disclosing figures for individual companies. (b) At end of period.

Gasoline Consumption

(In Thousands of Barrels of 42 Gallons)

	1952	1953	1954	1955	1956	1957	1958
Jan.	86,863	89,634	89,852	96,397	100,642	109,295	107,174
Feb.	82,043	86,458	86,206	88,464	98,088	96,694	.....
Mar.	87,065	98,158	101,549	105,684	112,412	113,166	.....
Apr.	98,563	102,044	103,866	111,116	113,034	115,820	.....
May	101,137	105,918	104,418	115,707	123,560	124,325	.....
June	99,305	114,703	113,037	120,710	126,838	121,598	.....
July	105,367	112,969	112,231	115,653	120,708	130,251	.....
Aug.	102,954	109,124	110,223	121,816	125,847	128,808	.....
Sept.	100,095	106,158	104,706	113,379	111,574	113,567	.....
Oct.	103,689	106,037	105,607	112,558	119,204	119,334	.....
Nov.	91,326	99,210	102,393	109,212	112,113	107,705	.....
Dec.	95,817	100,225	104,258	111,034	108,096	112,691	.....
Total	1,154,254	1,230,629	1,238,346	1,321,730	1,372,116	1,393,254	.....

Source: U. S. Bureau of Mines.

U. S. Gross Imports of Balata, Jelutong, Gutta-Percha, etc.

(All Quantities in Long Tons)

Year	Balata: Tons	Balata: Value	Jelutong: Tons	Jelutong: Value	Gutta-Percha & Other Guttas: Tons	Gutta-Percha & Other Guttas: Value
1945	1,361	907,253	....	.....	36	21,970
1946	2,281	2,233,065	304	256,169	423	458,064
1947	1,982	2,276,531	2,878	1,496,887	392	779,591
1948	1,195	805,078	3,401	2,377,765	423	542,788
1949	1,391	814,554	1,043	834,978	197	189,021
1950	2,117	1,589,885	1,789	1,515,162	541	745,418
1951	2,452	1,973,271	1,669	2,608,359	383	430,539
1952	988	762,994	1,636	2,094,983	282	385,890
1953	1,619	866,248	1,027	1,166,837	235	303,116
1954	949	504,065	2,196	2,624,926	417	511,055
1955	1,022	967,369	1,679	1,731,821	284	318,115
1956	1,396	1,111,165	1,851	1,909,447	290	309,615
1957	1,037	670,821	1,680	1,942,067	230	270,487
1957:						
Mar.	89	51,830	150	178,499	16	7,894
Apr.	167	100,490	134	160,369	28	23,714
May	201	116,150	192	225,257	69	87,987
June	36	17,426	130	134,438	22	35,112
July	33	15,195	161	185,524	28	32,282
Aug.	19	10,245	126	138,622	7	5,544
Sept.	164	119,808	110	145,817	16	16,422
Oct.	97	68,547	166	207,038	5	9,259
Nov.	110	85,126	117	136,806	2	13,797
Dec.	71	55,902	136	144,229	....	.....

Source: U. S. Department of Commerce.

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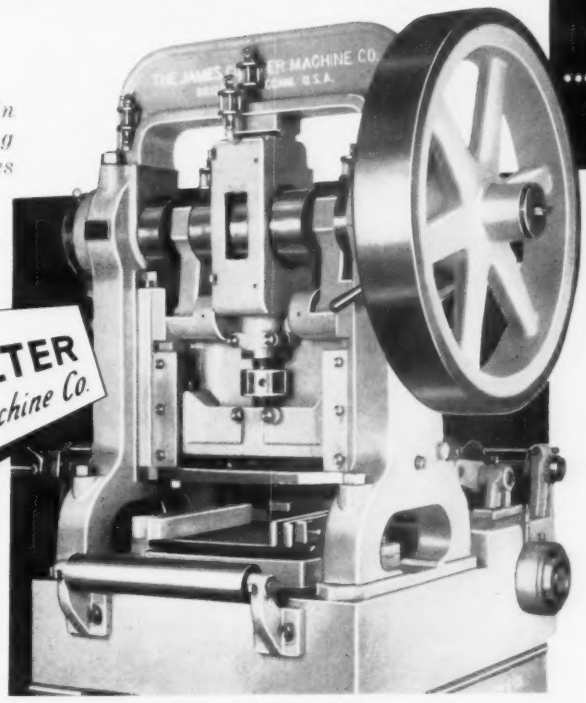

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Index to Advertisers

Adamson United Co. ... 223
Aetna-Standard Engineering Co. ... 220
Akron Rubber Machinery Co. ... 392
Albert, L., & Son ... 392
Allied Chemical & Dye Corp. ... 217, 237
Allied Rubber Products, Inc. ... 391
American Cyanamid Co.
Rubber Chemicals Dept. ... 363
American Hard Rubber Co. ... 389
American Synthetic Rubber Corp. ... 231
American Zinc Sales Co. ... 230
Atlas Electric Devices Co. ... 240

Barrett Div., Allied Chemical & Dye Corp. ... 217
Bedford-Bolling Co., Inc. ... 392
Bestread Products Co. ... 389
Borden Co., Chemical Div. ... 390
Borg-Warner Corp., Marbon Chemical Div. ... 219
Bramley Machinery Corp. ... 377
Brooklyn Color Works, Inc. ... 390
Brown Co. ... 353

Cabot, Godfrey L., Inc. ... 233
Cadillac Associates, Inc. ... 388
Carter Bell Manufacturing Co. ... 354
Carwin Co. ... 254
Cellusuede Products, Inc. ... 392
Century Products Co. ... 390
Chemical & Process Machinery Corp. ... 391
CLASSIFIED ADVERTISING ... 388-92
Cleveland Liner & Manufacturing Co. ... 224
Columbia-Southern Chemical Corp. ... Insert 270-71
Columbian Carbon Co. ... Insert Following 328
Concord Mica Corp. ... 388
CONSULTANTS SECTION ... 390
Continental Carbon Co. ... Insert Following 338
Continental Machinery Co., Inc. ... 392
Copoyimer Rubber & Chemical Corp.
Insert Following 256
Coulter, James, Machine Co. ... 387

D. P. R., Inc. ... 364
Darlington Chemicals, Inc. ... 368
Davis-Standard Div., Franklin Research Corp. ... 255
Day, J. H., Co. ... 216
Dayton Rubber Co. ... 366
Disco, Inc. ... 387
Dow Corning Corp. ... 226
Drake Personnel, Inc. ... 388
du Pont de Nemours, E. I. & Co., Inc.
Elastomer Chemicals Dept. ... Second Cover, 234

Eagle-Picher Co. ... 364
Eastern States Petroleum & Chemical Corp. ... 249
Eastman Chemical Products, Inc. ... 225
Eastman Machine Co. ... 368
Emerson Apparatus Co. ... 356
Emery Industries, Inc. ... 261
Enjay Co., Inc. ... 347
Erie Foundry Co. ... 218

Ferry Machine Co. ... 385
Flexo Supply Co., Inc. ... 391

Franklin Research Corp., Davis-Standard Div. ... 255
French Oil Mill Machinery Co. ... 242

Gelb, R., & Sons, Inc. ... 391
General Porcelain Manufacturing Co. ... 358
General Tire & Rubber Co., Chemical Div. ... 252-53
Genseke Brothers, Rubber Materials Div. ... 235
Glas-Col Apparatus Co. ... 276
Goodman, G. F., & Son ... 365
Goodrich, B. F., Chemical Co. ... 211
Goodrich-Gulf Chemicals, Inc. ... 232
Goodyear Tire & Rubber Co.
Chemical Div. ... Insert Following 226; 229
Gummi und Asbest ... 352

Hale & Kullgren, Inc. ... 220, 390
Hall, C. P., Co. ... 351
Harwick Standard Chemical Co. ... Fourth Cover
Houston Rubber Machine Co. ... 391
Howe Machinery Co., Inc. ... 391
Huber, J. M., Corp. ... 215

Industrial Ovens, Inc. ... 367

Johnson Corp. ... 366

K. B. C. Industries, Inc. ... 389
Kenrich Corp. ... 268

Leon Machine & Engineering Co. ... 372
Litzler, G. A., Co., Inc. ... 381

Marbon Chemical Div., Borg-Warner Corp. ... 219
Marine Magnesium Div. ... 357
Maryland Cork Co., Inc. ... 390
Merck & Co., Inc. ... 357
Monsanto Chemical Co.
Rubber Chemicals Dept. ... 221
Mount Vernon Mills, Inc. ... 248
Muehlstein, H., & Co., Inc. ... 345

National Aniline Div.
Allied Chemical & Dye Corp. ... 237
National Standard Co. ... 241
Naugatuck Chemical Division,
U. S. Rubber Co. ... 279, 280
Nelson Employment Service ... 388
Neville Chemical Co. ... 275
New England Engineering Co., Inc. ... 392
New Jersey Zinc Co. ... 222

Olin, R. R., Laboratories ... 390
Ozone Research & Equipment Corp. ... 365

Pennsylvania Industrial Chemical Corp. ... 256
Phillips Chemical Co.
Philblack ... 212
Philprene ... 251
Polymer Corp., Ltd. ... 267

Rand Rubber Co. ... 390
Randall, Frank E., Co., Inc. ... 356
Rapid Roller Co. ... 389
Reliable Rubber & Plastic Machinery Co. ... 391
Revue Générale du Caoutchouc ... —
Richardson, Sid, Carbon Co. ... 394
Ross, J. O., Engineering Div.,
Midland-Ross Corp. ... 262
Royle, John & Sons ... 383
Rubber Age Circulation ... 387
Rubber Corp. of America ... 369
Rubber Latex Co. of America ... 389

St. Joseph Lead Co. ... 250
Schaefer Machine Co., Inc. ... 352
Schulman, A., Inc. ... Third Cover
Scott Testers, Inc. ... 390
Scovill Manufacturing Co. ... 273
Shaw, Francis & Co., Ltd. ... 278
Shell Chemical Corp., Synthetic Rubber
Sales Div. ... Insert Following 358
Sherman Rubber Machinery Co. Div. ... 391
Shore Instrument & Mfg. Co., Inc. ... 385
Silicones Div., Union Carbide Corp. ... 264
Skelly Oil Co. ... 272
Snell, Foster D., Inc. ... 390
South Florida Test Service ... 390
Southern Clays, Inc. ... 373
Spencer Products Co., Inc. ... 372
Stamford Rubber Supply Co. ... 381
Stanford Engineering Co. ... 238
Stoner's Ink Co. ... 390
Sun Oil Co. ... 277

Tamms Industries Co. ... 371
Tapper, William ... 392
Taylor-Stiles & Co. ... 383
Texas-U. S. Chemical Co. ... Insert 246-47
Thiokol Chemical Corp. ... 263
Thomaston Mills ... 369
Titanium Pigment Corp. ... 274
Trade News Service ... —
Turner Halsey Co. ... 248

Union Carbide Corp. ... 264
United Carbon Co., Inc. ... Insert Following 348
United Clay Mines Corp. ... 355
United Engineering & Foundry Co. ... 269
United Rubber Machinery Exchange ... 391
U. S. Rubber Co.,
Naugatuck Chemical Div. ... 279, 280
Universal Oil Products Co. ... 239
Utility Manufacturing Co. ... 371

Vanderbilt, R. T., Co., Inc. ... Front Cover
Velsicol Chemical Corp. ... 243

Wellington Sears Co. ... 236
White, J. J., Products Co. ... 256
Williams, C. K., & Co., Inc. ... 244
Witco Chemical Co. ... Insert Following 338
Woloch, George, Co., Inc. ... 385
Wood, R. D., Co. ... 245

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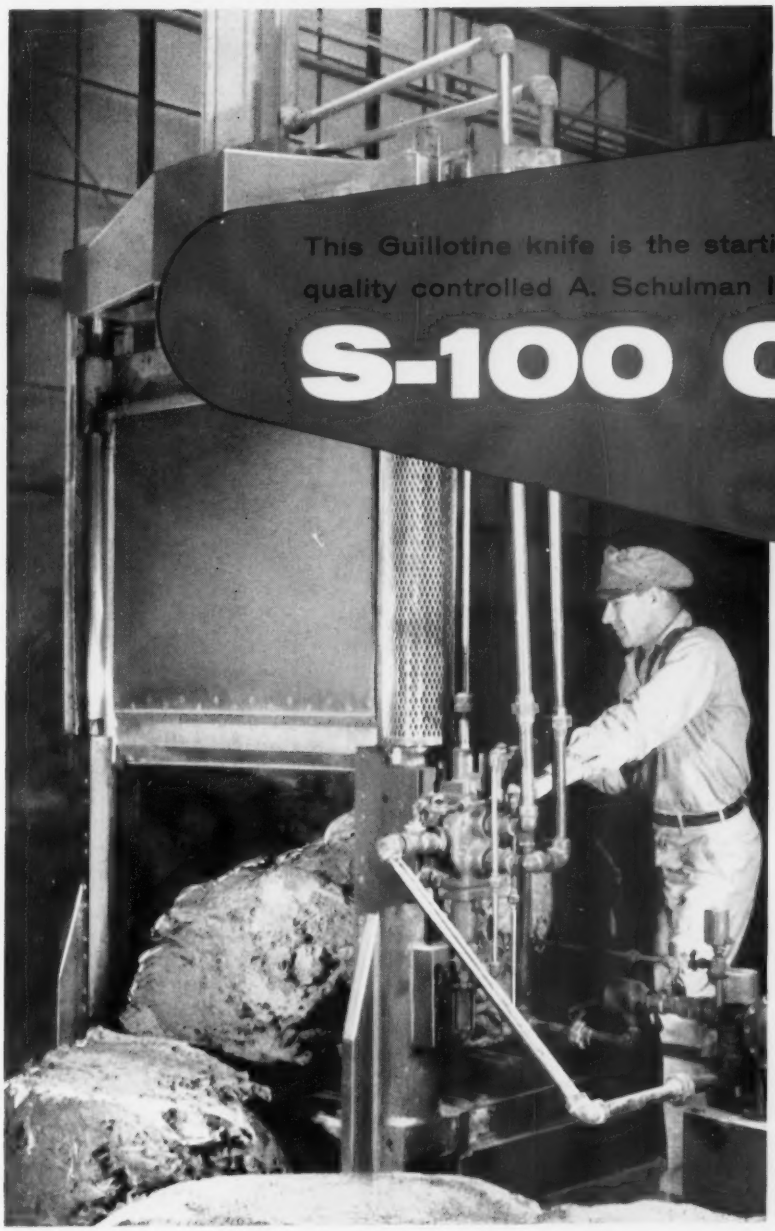

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In This Issue

A practical approach to dispersion studies page 463

How gamma radiation affects various elastomers page 472

Chemical-loaded molecular sieves — A new approach to compounding page 482

And articles on:

Keeping sales records page 488

Employee feeding page 495

Contents ..... page 401

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